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ECONOMIC DEVELOPMENT ADMINISTRATION

TECHNICAL
ASSISTANCE
PROJECT

U.S. DEPARTMENT OF COMMERCE

STUDY OF A
UINTAH AND OURAY RESERVATION
UREA FERTILIZER MANUFACTURING
PLANT AND ECONOMIC
DEVELOPMENT POTENTIAL OF A
CHARCOAL INDUSTRY

Contract No. 8-35297

Final Report.

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UINTAH AND OURAY RESERVATION
UREA FERTILIZER MANUFACTURING
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Final Report

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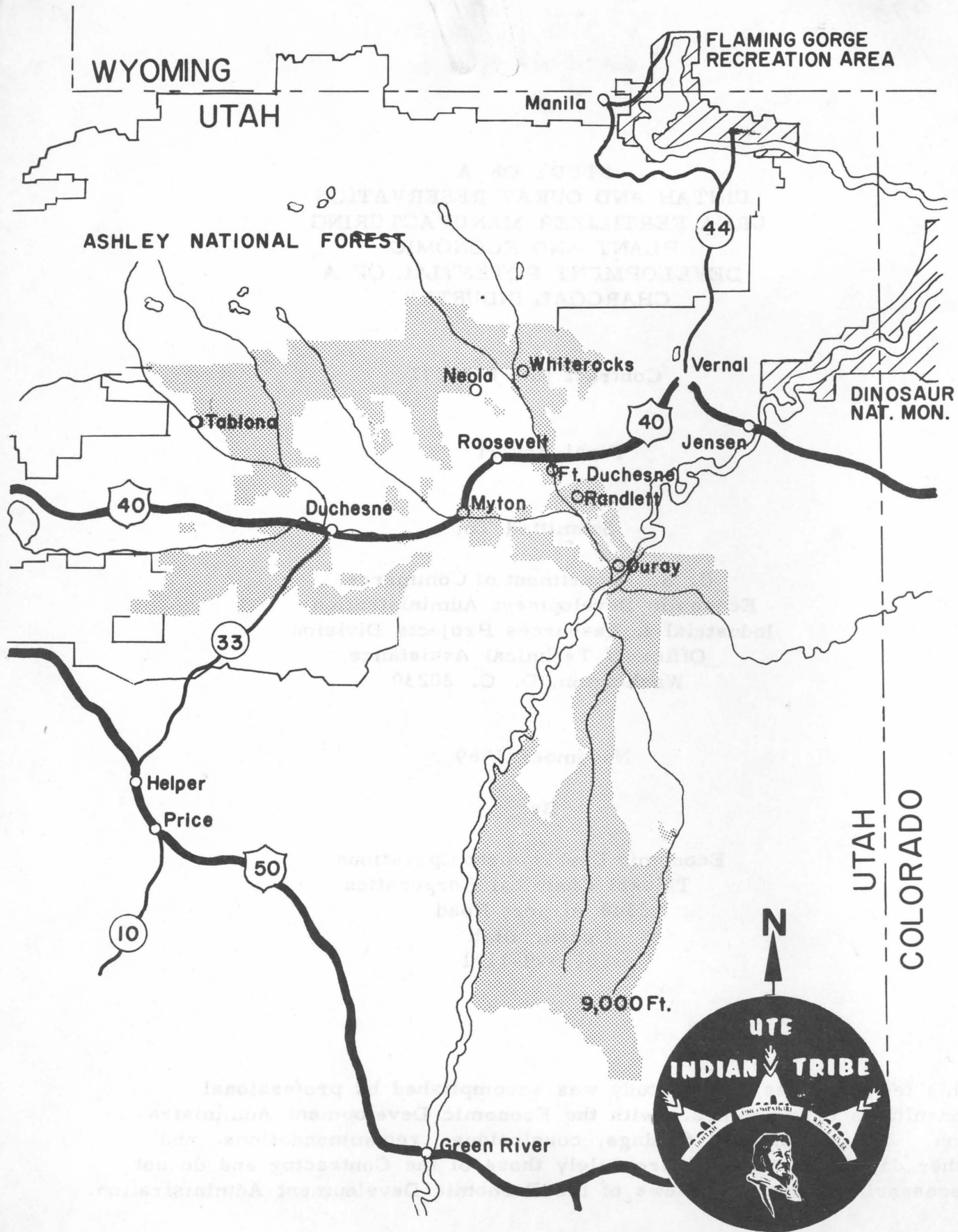
U. S. Department of Commerce
Economic Development Administration
Industrial & Resources Projects Division
Office of Technical Assistance
Washington, D. C. 20230

November 1969

By:

Economic Development Operations
Thiokol Chemical Corporation
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This technical assistance study was accomplished by professional consultants under contract with the Economic Development Administration. The statements, findings, conclusions, recommendations, and other data in this report are solely those of the Contractor and do not necessarily reflect the views of the Economic Development Administration.



Frontispiece-- Uintah and Ouray Reservation

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STUDY: UINTAH AND OURAY RESERVATION UREA FERTILIZER
MANUFACTURING PLANT AND ECONOMIC DEVELOPMENT POTENTIAL
OF A CHARCOAL INDUSTRY

INTRODUCTION AND SUMMARY

This final report is submitted by the Economic Development Operations of Thiokol Chemical Corporation to the Office of Technical Assistance, Economic Development Administration (EDA), U. S. Department of Commerce, in compliance with the provisions of Contract No. 8-35297, as amended. Study objectives, scope, methodology, findings, conclusions, and recommendations are described.

Basic information for this study was generated on the Uintah and Ouray Indian Reservation of Eastern Utah during intensive on-site and area market research, natural resource studies, personnel and plant location surveys, transportation studies, financial analyses, and training requirements considerations. Continuing study of economic implementation factors and compilation of other relevant data have followed preparation of this study. The study efforts were cooperatively developed and are jointly concurred in by Thiokol Chemical Corporation, the Ute Indian Tribe, and the Bureau of Indian Affairs (BIA).

During the early months of 1967, Thiokol Chemical Corporation conducted preliminary economic and marketing studies of basic analytical data to determine the feasibility of developing a urea fertilizer and allied products chemical complex in the Intermountain Area. A tentative agreement was formulated at that time with a regional fertilizer distributor for contract purchase of an average production of 125 ton per day, 45,625 ton per year, of fertilizer grade urea. The plant location planned was Ogden, Utah; however, various factors seemed to qualify the Uintah and Ouray Reservation as an ideal location for this type of plant. These factors included availability of natural resources, Ute Tribal desires to operate Indian-owned enterprises, and a high Reservation unemployment problem. Thiokol personnel held discussions with BIA personnel and the Ute Business Committee at the Ute Tribal headquarters in Fort Duchesne, Utah. Thiokol's previously prepared analysis of the advisability of establishing a urea fertilizer and allied products complex were reviewed during these meetings. The Tribal Business Committee expressed genuine interest and, with BIA concurrence, agreed that a new concerted feasibility study should be initiated prior to commitment of any Tribal funds. A proposal for EDA technical assistance, Urea Fertilizer and Allied Products Manufacturing Plant Study,

thus was prepared by the BIA, Ute Tribe, and Thiokol Chemical Corporation study team and was submitted to the Economic Development Administration.

Following the submittal of the technical assistance proposal, Thiokol conducted a continuing market analysis until commencement of the EDA project in June 1968. During this period of market analysis, fertilizer market conditions changed considerably and by mid-1968 industrial capacity of production of urea and other chemical fertilizers exceeded demand to the extent that major producers were drastically lowering prices to eliminate competition. Thus, it was not possible to negotiate a firm agreement with the potential Intermountain Area fertilizer distributor for a projected 125-ton-per-day output of the planned 200-ton-per-day plant. Thiokol, BIA, and Ute Tribe members of the study team then decided that initial studies should concentrate in researching the urea and allied product markets specifically within the Intermountain Area.

Results of the market research indicated that the desired goal, positive economic development resulting in creation of employment for members of the Ute Indian Tribe, could not be attained if such development was limited to urea and related chemical fertilizers. A basic recommendation was made then that the study effort be broadened to include production and marketing of charcoal, firewood, and other wood products to utilize the vast reserves of pinon pine and juniper on the Reservation. A preliminary study of the wood products industry revealed that, at best, this type of industry would provide only limited impact on the unemployment problems of the Ute Indians. Thiokol completed the original development study by making a comprehensive examination of the feasibility of establishing a charcoal industry on the Reservation utilizing the pinon pine and juniper resources available in the area. The Ute Business Committee adopted a resolution stating its intent to establish a Ute Tribal pinon pine wood products enterprise if further studies indicated it to be economically feasible.

To finalize the study, Thiokol utilized the following methodology for examining the feasibility of producing and marketing charcoal briquets in the Intermountain and West Coast regions. This method consisted of contacting the four major firms heavily involved in marketing of charcoal in these areas, supplying them with the study information developed to date, and obtaining from them independent viewpoints concerning the economic value of pinon pine charcoals. The firms were asked to base their opinions on independent and factual information available to them. Immediate implementation would be the key

to this approach. If results were positive, and one of the firms indicated strong interest, the natural result would be for Thiokol to act as an intermediary until the interested firm independently negotiated such details with the Ute Tribe as Tribal participation, capital investment agreements, operating functions, and implementation.

Of the four firms contacted, two initially expressed enthusiasm for the possibility of charcoal being produced and briquetted on the Uintah and Ouray Indian Reservation. Their first concern was quality of charcoal produced from pinon pine wood. They also were concerned about harvesting and production costs. One of these firms expressed the potential of a yearly market of up to 5,000 tons of lump charcoal in California markets. The other firm conducted quality analyses on the pinon pine charcoal.

In summation, it was found that the establishment of a charcoal briquetting industry, including production and marketing of lump charcoal, was not feasible as a significantly strong enterprise to bring immediate and meaningful economic development to the Uintah and Ouray Indian Reservation. This conclusion was based on the following factors.

1. Significant competitive disadvantage in the West Coast market with Mexican lump charcoal prices.
2. Significant competitive disadvantage in Intermountain states (Salt Lake City and Denver) with producers utilizing:
 - a. Low-cost efficient production processes.
 - b. Low-cost wood waste and lignite feed stocks in highly automated carbonizing retort furnaces.
3. Significant competitive disadvantage with Ozark hardwood charcoal briquets with respect to quality.
4. Significant competitive disadvantage generally in that consumer acceptance of pinon pine charcoal briquets would have to be substantiated due to possible objectionable characteristics of this type of charcoal to retain its pine resin odor. Establishment of consumer acceptance market testing is both costly and time consuming with highly unpredictable results.
5. Significant competitive disadvantage with respect to resource problems; timber density and comparatively low yield of charcoal per cord of processed pinon pine.

Discussions with spokesmen of firms presently involved in marketing of charcoal briquets in the Intermountain and West Coast Areas were of considerable value in developing independent evaluations based on the business aspects of charcoal briquet production and marketing. The experience of two of these firms, C. B. Hobbs Corporation and Keeter Charcoal Company, was particularly beneficial to the study team in helping to finalize the conclusions.

C. B. Hobbs Corporation officials visited the projected Reservation timber harvesting areas. Discussions with the Ute Tribe, BIA, and Thiokol personnel concerning a charcoal production and marketing enterprise on the Uintah and Ouray Reservation led to a recommendation to concentrate on lump charcoal marketing on the West Coast, similar to that being shipped from Mexico. Hobbs was concerned about the low density of pinon pine and juniper compared to normal hardwood timber harvesting areas and recommended that automated harvesting and charcoaling equipment be utilized to eliminate costly and inefficient manual processes.

Keeter Charcoal Company expressed an initial concern pertaining to the quality of charcoal produced from pinon pine and offered to make an independent analysis. Pinon pine was shipped from the Reservation to Crickett, Arkansas, loaded into Missouri-type kilns, charred, and made into lump charcoal and briquets for further analysis. The analysis revealed that the charcoal yield per measured cord of pinon pine would very likely make this wood prohibitive for establishing a charcoal industry for the Utes.

The analytical details acquired during this study with respect to the Reservation, its natural resources, a potential development of industries with urea fertilizer, and pinon pine-juniper wood charcoal products follows, including conclusions and recommendations.

ANALYSIS AND RESULTS

In analyzing the economic potential of the Uintah and Ouray Ute Reservation, the Thiokol-BIA-Ute study team first determined the practicability of locating an urea fertilizer and allied products manufacturing plant in or near the area. Results indicated that since the production capacity for urea and other chemical fertilizers exceeds existing demands, successful industrialization is not possible if effort is limited to just these products.

Reservation industrialization possibilities other than urea were analyzed in this study, as were the environmental, marketing, and resource factors affecting such possibilities. Results of these analyses are detailed in this report section.

A. RESERVATION FACTORS

Analysis of the Reservation included such important local factors as population, labor supply, possible industrial parks, developments planned, tribal investments, existing enterprises and businesses, educational opportunities, medical care facilities, law enforcement of the area, recreation, transportation, water supply, waste disposal, and natural resources, including electrical power and natural gas. Findings of each are presented in the following pages.

1. POPULATION

Three different bands comprise the Ute Indian population of the Uintah and Ouray Reservation. These bands include the Uintah, Uncompahgre, and Whiteriver Bands. Residing on the Reservation are 1,271 enrolled Ute tribal members, while another 340 live off the Reservation. In addition, approximately 400 unenrolled mixed-blood Indians live in the general region. Total population, Indian and non-Indian, living in the Uintah Basin, is about 20,000.

2. INDIAN LABOR FORCE

Total available Indian labor force, age 16 years and over, is:

	<u>Male</u>	<u>Female</u>	<u>Total</u>
Permanently Employed	95	9	104
Temporarily Employed	11	2	13
Unemployed	<u>179</u>	<u>162</u>	<u>341</u>
 TOTAL LABOR FORCE	285	173	458
 POPULATION	634	626	1,260

Nearly 85-percent of all employable male Ute Indians on the Reservation live in five communities. By count, they are Ouray, 16; Randlett, 61; Fort Duchesne, 51; Myton, 25; and Whiterock, 88. The remaining males reside in rural areas on the Reservation.

3. INDUSTRIAL PARKS

No industrial park presently exists on the Reservation. The Ute Tribal Business Committee has endeavored to find one definite industrial enterprise of sufficient size to locate there before development of such a park. There is a possibility that the park could be designed to include certain features specifically designed for such an industrial enterprise. In any event, the park would include a prepared site, access roads, utilities, sewage system, and possibly industrial waste disposal.

4. PLANNED DEVELOPMENTS

Construction of the multimillion-dollar Bottle Hollow Recreation Center is scheduled to begin early this year. The project, funded jointly by federal agencies and the Ute Tribe, will include a \$1 million dam-reservoir system and a \$1.4 million recreation complex that will include a motel, tourist cabins, and shops overlooking the reservoir. Construction of the complex by a private contractor will take about a year for completion.

Tentative approval also has been given to the Ute Indians by the State of Utah for tribal participation in the Land and Water Conservation Fund, which provides matching monies for campground development around certain popular and well-used lakes and reservoirs.

5. TRIBAL INVESTMENTS

Tribal monies are divided among several educational, operational, reserve, dividend, and investment funds. Some of the money is in the federal treasury, but most is banked with private financial institutions. The substantial investment funds is to be used for investment in industrial development. The extent of tribal financial participation in any projected enterprise thus depends on negotiations between the Tribal Business Committee and any proposed company. In the past, any proposal made to the tribe involving the tribe's minimum participation, according to the requirements of the Economic Development Administration has been met or exceeded. Tribal investment in industry has been an important consideration.

6. EXISTING ENTERPRISES

The Uintah Basin is oriented agriculturally with emphasis on cattle raising. Producing oil and gas wells, although concentrated in the eastern part of the Basin, also are found throughout. Considerable oil exploration is going on in the northern part of the Reservation. Several sawmills are in the area. Saw lumber is produced from the Reservation and from the adjacent Ashley National Forest.

The Ute livestock enterprise is the most significant present tribal business enterprise and has nearly reached its base herd size of 5,300. The 5,000 to 6,000 head marketed yearly bring high prices due to their high quality and the modern raising techniques, such as prefinishing used. Additionally, a Ute custom-hunting enterprise, Nu TuVeep, brings a high fee from sportsmen who are flown into an isolated hunting camp deep in the wilderness section of the Reservation.

7. BUSINESS ESTABLISHMENTS

The usual small-town shopping facilities available in Roosevelt include nationwide chain stores. All major automobile agencies, with their repair shops, also are represented. Nearby, Vernal, being a larger town, has more and varied shopping facilities. There is one bank in each of the two towns with national affiliations, and a local bank in Vernal.

Permanent rental housing units are available in both towns. Vernal has 256 hotel and 566 motel units. About 170 and 188 units, respectively, are available in Roosevelt.

The Uintah Basin is served by a full-time radio station located in

Vernal. Additionally, three television stations representing the NBC, CBS, and ABC networks are received there.

8. EDUCATIONAL

The normal range of grade schools and high schools are located on or adjacent to the Reservation. A new vocational school near Roosevelt Union High was completed and opened in September 1968. A resident extension division of Utah State University for Uintah Basin is headquartered in Roosevelt. It offers undergraduate, graduate, and special training courses upon demand.

A branch of the Utah State Extension Service, located in Fort Duchesne, offers assistance and training in agriculture, animal husbandry, and home economics.

9. MEDICAL FACILITIES

The U. S. Public Health Service, Division of Indian Health, operates an Indian Health Clinic at Fort Duchesne. In addition, hospital care, as well as medical, dental, optometry, and surgical care, are provided by contract facilities in Roosevelt and Salt Lake City. A new hospital in Roosevelt will be completed in 1969, which will contain an Indian wing and the Indian Health Clinic.

Located in Vernal, the modern and well equipped Uintah County Hospital has 30 beds with space and facilities available for enlargement to 42 beds. It is fully-staffed with doctors, registered nurses, a laboratory technician, and other required personnel. A privately-owned ambulance provides 24-hour service in the area.

10. LAW ENFORCEMENT

A tribal court and a police force is maintained on the Reservation, with jurisdiction over Ute Indians only. These are assisted by a federal law and order officer employed by the Bureau of Indian Affairs.

Non-Indians are subject only to county and state laws. Indians also are answerable to civil authority for civil offenses and law violations.

11. RECREATIONAL OPPORTUNITIES

Outdoor recreation is dominant in the Uintah Basin where hunting and fishing facilities are virtually unsurpassed. Such game as elk, deer, antelope,

mountain lion, bear, coyote, bobcat, chukkar, and pheasant are relatively abundant. Wild turkeys have been planted, and planting of mountain sheep also is being considered. Moose are found in the adjoining Ashley National Forest. Trout fishing is excellent in the miles of streams and rivers and in the lakes and reservoirs on and adjacent to the Reservation. The Bottle Hollow recreational complex will be ready for use by 1970.

Just north of the Reservation within the Ashley National Forest, the High Uintah wilderness area has been set aside for those who enjoy a forested and mountainous region unchanged by man. The thousands of lakes located in this wilderness are dominated by 13,490-foot King's Peak, Utah's highest.

Other types of recreational activities include horseback riding, bowling, tennis, baseball, football, basketball activities, and golfing in Vernal. Concerts by the Utah Symphony and other cultural groups are offered occasionally in Roosevelt and Vernal. A national museum of natural history emphasizing the prehistoric life that abounded once near the area a few miles to the northeast is known as Dinosaur National Monument. Directly north of Vernal is the famous Flaming Gorge National Recreation Area. Roosevelt and Vernal have most of the usual service and fraternal clubs.

Religious dances of the Ute Indians attract many visitors each year. Though dates change from year to year, Bear Dances are held in the spring (March or April) and Sun Dances in the summer (July or August).

12. TRANSPORTATION

A railroad does not operate in the Uintah Basin. Nearest railheads are the Denver & Rio Grande at Castle Gate, about 42 miles south of Duchesne; the Union Pacific, 80 miles west of Duchesne; and the D&RG at Craig, Colorado, 131 miles east of Vernal. A feasibility study of building a railroad in the Basin is being conducted by the University of Utah.

Trucking is the lifeline of the Uintah Basin. At least six lines serve the area. They are Link Trucking, Uintah Freightways, W. S. Hatch Company, Pacific Intermountain Express, Nebeker's Trucking, and Bob Jones Trucking Company. More freight continually comes into the Basin than goes out; hence, back-hauling is eagerly sought. U. S. Highway 40 is the main route between Denver and California.

Continental Trailways provides passenger bus service and has stops at Roosevelt and at a point one mile north of Fort Duchesne. Scheduled commercial air service via Frontier Airlines is available at Vernal, 23 miles east of Fort Duchesne. Roosevelt has a municipal airport, but it has no commercial flights.

13. WATER SUPPLY

The following five towns on the Ute Reservation have the indicated available industrial water supply.

	<u>Acre Ft./Yr.</u>	<u>Billion Gallon/Year</u>
Ouray	172,669	56.26
Duchesne	10,010	3.26
Myton	26,364	8.59
Fort Duchesne	6,000	1.95
Randlett	6,000	1.95

This supply could be pumped directly from the streams. Canal or ditch delivery would be practically impossible during the winter months.

A domestic water system was installed by the Ute Tribe in 1965. This system supplies water to most of the Indian and non-Indian towns in the central part of the Uintah Basin and is continually being improved and extended.

14. WASTE DISPOSAL PROBLEMS

Ample tribally-owned land for use in waste disposal is available at all proposed industrial sites within the Reservation. Thus, interested industrial firms needing land for waste disposal should consult with the Tribal Business Committee before the Tribe makes application for an industrial park. Depending upon circumstances and negotiations, the Ute Tribe would consider constructing certain waste disposal facilities if these are not considered part of a proposed industrial park.

15. ELECTRICITY

Electrical service is furnished by the Uintah Power and Light Company in accordance with: Electric Service, State of Utah, Schedule No. 3, General Service. The service will be available at any point on the Company's system having facilities of adequate capacity. This schedule calls for alternating current, single or three-phase electric service supplied at company's available voltage through one kilowatt-hour meter at a single point of delivery for all service required on the premises.

Monthly cost of the service, per kilowatt hour, currently is:

Rate:

\$4.30 per kwh for first 500 kwh*
\$3.10 per kwh for next 500 kwh
\$1.90 per kwh for next 5,000 kwh
\$1.20 per kwh for next 10,000 kwh
\$1.00 per kwh all additional kwh

*add 70 kwh for each kw of demand in excess of 5.

Voltage Discount:

The following voltage discount based on measured demand will apply where a customer takes service of 2,300 volts or higher from the company's available lines and provides and maintains all transformers and other necessary equipment.

20¢ per kw for first 100 kw of demand
10¢ per kw for all additional kw of demand

Net Minimum:

A charge of \$1.10 plus \$1.10 for each kw of demand over 5 kw will be levied but not less than \$3.30 for three-phase service.

Demand to the nearest kw is determined by the company's demand meter for the 15-minute period of the customer's greatest use during the month.

Negotiations for rates lower than the 1¢ per kwh are possible for industries that use very large amounts. Such negotiations involve the board of directors of the Uintah Power and Light Company and the Utah Public Service Commission.

16. NATURAL GAS SUPPLY

Mountain Fuel Supply Company furnishes natural gas to the western and central parts of the Uintah Basin, while Utah Gas Service Company supplies the eastern section.

The towns of Ouray, Fort Duchesne, and Randlett are not presently supplied with natural gas. A natural gas line does run very close to Ouray, and gas would be made available upon demand by an industry. Surveying has been completed for bringing a gas line to Fort Duchesne from nearby

Roosevelt. This line will serve (1) the community of Fort Duchesne, (2) the tribal and federal government offices here, and (3) the new Bottle Hollow recreational complex close by.

Natural gas utilization in the Mountain Fuel Supply Company service area follows the generally-accepted standards and procedures of the gas suppliers elsewhere for similar conditions.

The gas supplier's low pressure distribution system is operated at an average of seven inches of water gauge pressure. The company's intermediate pressure distribution system is operated at from 15 to 30 pounds of gauge pressure. For all domestic or commercial appliances, this pressure is reduced to approximately seven inches of water gauge pressure at the point of entrance to a building or dwelling. Industrial consumers are invited to consult with the company regarding pressures available for industrial application of gas.

B. NATURAL RESOURCES FOR POTENTIAL DEVELOPMENT

Natural resources on and adjacent to the Uintah and Ouray Reservation consist basically of crude oil, natural gas, gilsonite, bituminous sandstone, oil shale, coal, phosphate, metallic minerals, nonmetallic minerals, timber, and water.

Knowledge of actual number, extent, quality, and quantity of natural resource deposits is inadequate since an in-depth geologic survey has not been made on the Reservation or on federal lands adjacent to it.

1. CRUDE OIL

Approximately 200 oil wells in eastern Utah produce an estimated 20,000 barrels a day. An active oil exploration effort has resulted in development of several new wells adjacent to the reservation, one producing approximately 350 barrels a day; two other wells produce a total of over 2,400 barrels a day. Drilling and exploration efforts are increasing because of these developments.

No refining facilities exist in the Uintah Basin. A crude oil transfer pipeline from the Uintah Basin to the Salt Lake City refineries consists of two 10-inch lines through the Myton area. A new line to Myton soon will connect the Neola production area.

2. NATURAL GAS

Natural gas is a major natural resource in the Uintah Basin; reserves there are estimated in excess of 2 trillion cubic feet. This fuel is collected and transmitted to the Mountain Fuel Supply Company's system by a 20-inch main line to the Wasatch Front. A Pacific Northwest Pipeline Company line from the Four-Corners Area of the Southwestern United States carrying natural gas to the Pacific Northwest passes east of Vernal through the Ashley Field. Each of the newly developed oil wells in the Neola area of the Uintah Basin can produce 5 to 6 million cubic feet of natural gas.

3. GILSONITE

Gilsonite, a unique solid petroleum substance occurring in pure form in large veins in the Uintah Basin, already supports a multi-million

dollar mining industry there. Estimates of reserves run as high as 30 million tons, worth approximately \$1.3 billion. The veins, many exposed at the earth's surface, are from 2 to 20 feet wide and from 100 to 1,500 feet deep.

Gilsonite is a predominantly aromatic asphaltite type substance that fuses relatively easily and burns like tar. It is brittle and has a distinctive conchoidal to hackly fracture. When fresh Gilsonite has a brilliant black luster; but weathered, it and some of its more refractory varieties have a dull, soot-black color. Gilsonite has a specific gravity of 1.07, is soluble in asphalt-based petroleum, and frequently is employed to change the consistency of lighter petroleum products. It is a bitumen and has approximately the composition of an asphalt-based petroleum, but with most of the volatile constituents missing.

When heated to 250° F or higher (up to 500° F for the more refractory varieties), Gilsonite melts and liberates some volatile constituents. It can be heat refined to produce high octane gasoline, motor oil, and other petroleum products, and it leaves a residue of pure carbon coke of high market value.

4. BITUMINOUS SANDSTONE

Bituminous sandstones occur in many locations of the Uintah Basin, the most prominent being at Asphalt Ridge, west and southwest of Vernal. An estimated 1.175 billion cubic yards of this material exist in an 11.5 by 1.5 mile track back from this outcrop and containing as much as 2 billion barrels of bitumen (paraffin-base oil). These bituminous beds range from a few feet to over 190 feet thick along the east flank of Asphalt Ridge. Bituminous sandstone deposits exist within and adjacent to the Reservation in an area west of Whiterocks and also in Yellowstone Canyon.

Legislation in late 1960 opened bituminous sandstone and Gilsonite deposits on federal lands to public leasing. Previously for approximately fifty years, these lands were withheld from all forms of exploration, although many valuable deposits were known to exist there. Leasing on Federal lands is very difficult; thus, the reserves in these areas are still undeveloped.

5. OIL SHALE

The oil potential of the Uintah Basin from oil shale has been estimated roughly at 1.3 billion barrels. Rich oil shale is a dark brown, fairly dense, fine grained laminated rock that is resistant to weathering and forms conspicuous blue-gray ledges in the softer enclosing sediments.

Oil shale is a marlstone composed principally of inorganic matter (50 to 75%), dolomite and calcite; clay materials (up to 21%); and analcite (1 to 16%). Organic matter in oil shale ranges from 0 to 50%, yielding up to 87 gallons of oil per ton of rock.

When oil shale is heated to 400° F or above in a closed system, part of the organic material passes off in a gaseous form and can be condensed and recovered as liquid petroleum, or shale oil. This petroleum has a specific gravity of from 0.859 to 0.9327. It is a black, highly viscous, waxy crude oil, which at room temperature is a soft slushy solid. Its pour point is 90° F; thus, transportation by pipeline of the raw shale oil is not practical. When properly refined, the finished derived product is indistinguishable from its natural petroleum counterparts.

The Naval Oil Shale Reserve and other high potential deposits are on or immediately adjacent to the Uintah and Ouray Reservation. The Naval Oil Shale Reserve was established by Presidential Order of December 6, 1916. This reserve consists of 132 square miles in Townships 12 and 13 South, Ranges 18 and 19, East. Exposures of the oil shale border the canyon of the Green River and tributary canyons, but most of the rich oil shale beds are covered by overburden.

Prior to the Mineral Leasing Act of February 25, 1920, oil shale could be acquired by placer mining location, and thousands of acres of valuable oil shale lands were claimed under the mining laws. Many of these claims in the Dragon-Watson area were subsequently patented; hence, many of the better surface deposits of oil shale in Utah today are on privately owned land.

After 1920, oil shale could no longer be acquired by mining claim, but mining leases were available on a rental-royalty basis through the U.S. General Land Office. Owners of oil shale mining claims were granted a preference provided they relinquished their claims to the government. However, by Executive Order of April 19, 1930, all oil shale lands owned by the United States, including outstanding unperfected mining claims, were withdrawn "temporarily" from all forms of disposal, except patent under the mining laws. The withdrawal effectively barred any private acquisition or development of federally owned oil shale lands in Utah, Colorado, and Wyoming.

The Bureau of Mines has operated an oil shale pilot plant at Rifle, Colorado, exploring feasible extraction techniques. A private firm is planning to build a commercial production plant at Parachute Creek, 160 miles west of Denver. Primary reason for the increasing interest in extraction of oil from oil shale is that present U.S. oil reserves will last only into the 1980's at the present depletion rate. The federal government is analyzing different alternatives to development of the reserves under federal lands and considering the various existing extraction

processes: surface retort, in-situ retort, water pressurization, chemical explosives, and high voltage electricity. Indications are the federal government feels the best way to develop this resource is by government-industry coordinated efforts.

6. COAL

The combined coal resources of the Uintah Basin, while not great in comparison with the larger coal fields elsewhere in Utah and Colorado, still are significant from the standpoint of local markets and future industry. An estimated 44 million tons of coal are available in the Basin's Deep Creek district alone. At present, coal mines in the Uintah Basin are idle; however, interest seems to be picking up and possible future coking techniques will utilize the coal resources.

7. PHOSPHATE

Phosphatic rock is exposed along the south flank of the eastern Uintah Mountains at about 7,000 to 8,000 feet elevation. West of the Whiterocks River, the Park City Formation is buried beneath the tertiary sediments for a distance of more than 25 miles. The deposits east of this area presently are being mined by the Stauffer Chemical Company at Brush Creek. This plant presently is closed because of nonavailability of sulfuric acid and other economic problems. An estimated 2 billion tons of phosphate rock still exist in the Uintah Basin with just this one mining operation in progress.

8. METALLIC MINERALS

Deposits containing commercially valuable metallic minerals such as copper, lead, zinc, silver, iron, manganese, gold, molybdenum, and uranium are relatively scarce in the Uintah Basin. Of the few known deposits there, most are merely in the prospecting stage and the remaining deposits, such as molybdenum and fossil-replacing copper near Ouray, are scientific curiosities in addition to having past or potential value.

9. NONMETALLIC MINERALS

Several indications of possible deposits of valuable nonmetallic minerals or rock such as aeolites, gypsum, salt, bentonite, trona, sand and gravel, flagstone, and others now lack significance; but with continued

industrial development of the Unitah Basin these may have added meaning.

10. TIMBER

Commercial forests of 30,000 acres of timber on the Reservation contain approximately 54 million board feet. The saw timber consists of ponderosa pine, lodgepole pine, Douglas fir, alpine fir, and Engleman spruce. In addition to this timber, which is being utilized, prime resources of pinon pine and juniper wood suitable for firewood and charcoal are available over large areas of the Reservation.

Ground surveys made in 1968 by BIA personnel in the Hill Creek extension of the Reservation projected 420,000 tons of dry and 586,000 tons of green wood. Additional areas near Whiterocks, John Starr Flat, and on adjacent Bureau of Land Management (BLM) lands were surveyed with indication of potential support there for charcoal and firewood industries. Positive additional benefits can be derived from the clearing of pinon pine and juniper from potentially excellent cattle range.

C. UREA MARKET RESEARCH

Original request for technical assistance to establish a urea fertilizer plant was based on data developed prior to February 1967. Since then many significant changes have taken place in the world, national, and local fertilizer industries. Current and projected market outlook for urea fertilizer has been analyzed as follows.

1. WORLD MARKET

Fertilizer production throughout the world increased rapidly from 1960 through 1967. In the United States and Western Europe production increased 50 percent between 1963 and 1965.

Major producers looked for a very rapid increase in the use of fertilizer in underdeveloped countries. Export markets have not developed as they expected; primarily, as a result of the following three factors.

1. A serious shortage of foreign exchange exists.
2. Overall level of agricultural technology in underdeveloped countries must be raised prior to utilization of large quantities of commercial fertilizers.
3. The State Department's Agency for International Development (USAID) has delivered only a fraction of originally forecast quantities of fertilizer to underdeveloped countries. Forecast for 1967 was for \$450 million; actual deliveries were approximately \$140 million, or 31 percent of the estimate.

A recent study made by the Tennessee Valley Authority for the USAID agency indicates that there will be an excess of production capacity over consumption through 1972, as indicated in Table I.

TABLE I
RATIO OF POTENTIAL WORLDWIDE
FERTILIZER PRODUCTION-CONSUMPTION

	<u>Consumed</u>		<u>Projected</u>	
	<u>1965</u>	<u>1967</u>	<u>1970</u>	<u>1972</u>
<u>World Summary</u>				
Developed	1.18	1.22	1.25	1.19
Developing	0.64	0.53	0.66	0.59
World	1.10	1.10	1.14	1.07

	Consumed		Projected	
	1965	1967	1970	1972
<u>Developed Regions</u>				
North America	1.25	1.37	1.50	1.28
Western Europe	1.24	1.26	1.24	1.22
Eastern Europe	1.10	1.04	1.07	1.12
Oceania, Japan	0.93	1.10	1.13	1.10
<u>Developing Regions</u>				
Asia, less Japan	0.59	0.46	0.56	0.48
Africa	0.80	0.77	1.38	1.30
Latin America	0.67	0.57	0.64	0.65

The world fertilizer market reflects a satisfactory long range growth potential. However, this potential is less attractive to fertilizer producers because of current serious problems of over-production and depressed prices.

2. NATIONAL MARKET

The fertilizer market in the United States in 1968 is characterized by over-capacity, large inventories, low prices, and reduced profits. Prices of all major fertilizer products declined significantly; ammonia prices in Arizona declined 27 percent during 1967. Price of urea delivered in the Intermountain Area declined from approximately \$100 per ton to \$71 per ton for bulk shipments. Anhydrous ammonia in the Midwest dropped from \$100 per ton to \$65 per ton, while other fertilizer products registered similar reductions in price.

Prices dropped because of the over-capacity that resulted from enthusiasm of many large companies over the growth potential of the fertilizer industry during the early 1960's. These companies rapidly expanded production of the three basic fertilizer ingredients: nitrogen, potash, and phosphate. In the five years preceding 1967, United States fertilizer companies invested \$4 billion for new mines, plants, transportation, and distribution systems, resulting in a very large increase in the capacity of the industry. Since 1963 the capacity of phosphate rock mines was increased from 20 million tons per year to 39 million tons per year; an increase of 95 percent. Ammonia capacity increased from 3.5 million tons per year to 9.6 million tons per year: an increase of 170 percent. Production of potash in the United States has not kept pace with ammonia; however, Canadian production has increased to more than make up any apparent shortages in the United States.

In the 1950's, United States fertilizer usage was growing at a rate of about 6 percent per year. Because of pressure to solve the world food problem, many people assumed the rate of consumption would increase at a much greater rate, and plant expansion plans were based on a high anticipated growth figure. Actual growth rate of fertilizer consumption in the United States averaged around 7 to 8 percent per year during 1965 through 1967.

Other factors also combined to complicate the fertilizer situation during 1967 and 1968. Application of fertilizer was reduced due to wet spring seasons. Inventory at the end of the fertilizer season amounts to about 12 months production, worth approximately \$2 billion at retail price.

Companies have made large capital investments in plants designed to operate efficiently at high production levels. To maintain efficient production, they continue producing at high rates even though the resulting large inventories have lowered market prices. In March of 1968, anhydrous ammonia was selling as low as \$45 a ton, while the published price was \$60 per ton. Diammonium phosphate was discounted to \$75 per ton, though the published price was \$95 per ton.

The problem has been intensified by technological improvements, resulting in substantial economies of production, particularly for ammonia. New production techniques make it possible to cut the cost of producing ammonia from \$40 per ton to \$20 per ton; major fertilizer producers are purchasing \$400 million worth of more efficient ammonia production facilities. Location is a factor because it costs approximately \$20 per ton, for example, to transport ammonia from the Texas Gulf area to Central Iowa. Producers feel that a pipeline presently under construction will reduce this cost of transportation to approximately \$8 per ton. Less efficient plants in these market areas will be forced to lower prices after completion of this pipeline.

The Government's farm subsidy policy further complicates the situation by taking out of production 10 million acres of agricultural land, mostly in the Midwest.

Fertilizer manufacturers are being forced to integrate vertically and develop wholesale and retail distribution systems, while closing down their less efficient plants. The Central Farmers Cooperative, organized in 1946 for the purpose of providing fertilizer to the farmers at the lowest possible price, distributes to 21 regional cooperatives having 7,500 sales outlets in 43 states and in Canada. In 1967 the organization sold \$550 million worth of fertilizer (28 percent of the national U.S. retail market). Concerned that the fertilizer companies would begin to enter the retail market themselves, Central Farmers Cooperative began to integrate back into fertilizer materials production and now produces basic fertilizer ingredients, having an investment in an ammonia plant in Louisiana, a phosphate facility in Florida, and potash and urea plants in Canada. This type of vertical integration further denies the growth of less competitive producers.

Price competition, due to like appearance of products is the primary competitive factor and has resulted in competitive pricing and discounting, with rebates, similar to the gasoline price wars of a few years ago. The fertilizer industry in the United States apparently has excess capacity that will last through 1972 and it may be a decade until fertilizer consumption and production come back into reasonable balance. Inevitably only the large, well-financed, vertically integrated companies will survive and the smaller,

weaker companies will either go out of business or will merge with larger concerns.

3. INTERMOUNTAIN MARKET

The Intermountain states fertilizer market is not significantly different than the national market. During the 1960's, the local fertilizer production increased greatly with the development of new phosphate mines and processing plants, and local application has not developed as it has in the Midwest and Pacific Coast States for the following two primary reasons.

1. Much of the region is dry farmed and it is not possible to use significant quantities of commercial fertilizer due to lack of moisture.
2. Farms in the Intermountain Area are generally smaller and less easily adapted to application of modern fertilizing techniques.

Over production and slow growth of the Intermountain fertilizer market has resulted in closing of large and expensive local production plants. Stauffer closed its phosphate operation in the Uintah Basin and Monsanto and El Paso Natural Gas closed their phosphate facilities in Soda Springs, Idaho. El Paso Natural Gas built its new \$40 million phosphatic fertilizer plant at Soda Springs, Idaho, having an advance agreement with a local cooperative for 50 percent of the plant's output. The marketing plan was to cut prices to sell the other 50 percent, but the competitor had a more efficient operation, a better distribution system, and was able to meet every price cut until El Paso closed the plant to stop its loss.

Total consumption of all commercial fertilizers in the Intermountain area is shown in Table II, consumption by type is shown in Table III, and consumption of urea fertilizers is shown in Table IV.

TABLE II
TOTAL INTERMOUNTAIN FERTILIZER CONSUMPTION

	1965 (Tons)	1966 (Tons)	1967 (Tons)
Montana	75,082	102,358	141,160
Idaho	254,109	288,140	305,250
Wyoming	30,970	32,252	50,287
Colorado	187,981	189,508	226,226
New Mexico	66,459	67,052	73,722
Arizona	234,741	233,863	241,853
Utah	60,043	58,842	76,210
Nevada	13,146	11,794	14,767
TOTAL	922,531	983,809	1,129,475

TABLE III
TOTAL INTERMOUNTAIN FERTILIZER
CONSUMPTION BY TYPE

(Year Ending 30 June 1967)

<u>Type</u>	<u>Tons</u>
Mixtures	262,355
Nitrogen Material	505,355
Natural Organic Material	18,050
Phosphate Material	293,977
Potash Materials	15,835
Secondary and Micronutrient Material	33,903
	<u>1,129,475</u>

TABLE IV
CONSUMPTION OF UREA FERTILIZERS
IN THE INTERMOUNTAIN AREA

(1965 through 1967)

	<u>1965</u> <u>(Tons)</u>	<u>1966</u> <u>(Tons)</u>	<u>1967</u> <u>(Tons)</u>
Montana	232	201	352
Idaho	8,635	6,904	10,421
Wyoming	44	182	214
Colorado	5,017	4,974	4,017
New Mexico	5,160	4,799	3,637
Arizona	25,902	24,721	25,697
Utah	1,695	1,403	808
Nevada	217	180	420
<u>TOTAL</u>	<u>46,902</u>	<u>43,364</u>	<u>45,566</u>

In the State of Utah urea sales were only 4 percent of the total fertilizer used and only 9 percent of nitrogen materials, averaging only 1,300 tons per year for the past three years. Close analysis of the market in adjacent states is necessary because of transportation limitations and the fact that other producers are in the area. Urea plants now are located at Cheyenne, Wyoming; Kennewick, Washington; and Hercules, San Francisco, Los Angeles and El Centro, California. The market that a Utah plant might service probably would be restricted to parts of adjacent states where a freight advantage exists.

Future use of urea for fertilizer and animal feed is projected in Table V. These projections are based on an assumed 10 percent per year rate of increase.

TABLE V
FORECAST CONSUMPTION OF UREA IN THE
INTERMOUNTAIN STATES

(Fertilizer and Animal Feed)
(1968 - 1976)

<u>Year</u>	<u>Fertilizer (Tons)</u>	<u>Animal Feed (Tons)</u>	<u>Total (Tons)</u>
1968	17,780	24,200	41,980
1969	19,558	26,620	46,178
1970	21,514	29,282	50,796
1971	23,665	32,210	55,875
1972	26,031	35,413	61,444
1973	38,634	38,974	77,608
1975	34,647	47,159	81,806
1976	38,112	51,874	89,986

The latest available statistics indicate that total United States consumption of urea for cattle and sheep feed was approximately 165,000 tons per year. The Economic Research Service of the Department of Agriculture estimated the portion utilized in the Mountain States to be 26,400 tons. Industrial uses of urea in this region are relatively limited and can be considered negligible for the purpose of forecasting consumption. National consumption data for all uses are not available, but the trend for urea use as fertilizer was:

1965	427,555 tons
1966	467,359 tons
1967	503,483 tons

The major factors influencing the use of urea as a fertilizer in the Intermountain Area are:

1. Substantial production of phosphatic fertilizer exists and specialists from universities and industries, being familiar with its use and its ease of application, recommend it to the farmer. Manufacturers have well developed and well established distribution and bulk application systems.

2. Urea is hygroscopic, making it hard to store and handle in bulk and is even more difficult to use in the presence of other fertilizer materials.
3. Farmers have not been educated to the use of urea fertilizers to the degree that they have been trained to use other fertilizers.

The following factors have slowed the rate of increase in the use of urea as animal feed.

1. Most animal feeders in the Intermountain Area utilize substantial quantities of high protein content alfalfa hay; hence, protein supplements are not required.
2. The price of urea has been high compared with such other high protein supplements as cotton seed meal and soybean meal.
3. Many farmers have not been educated in the use of urea and some are reluctant to use it because it may be toxic.
4. Not many large feed lots or feed plants exist in the area and those that do have only recently started to use urea to the maximum recommended level.

Table V also shows a forecast of the total urea consumption in the six Intermountain States. When the total is compared to the projected plant output of 66,000 tons per year, it becomes evident that a plant located in Utah would have difficulty developing a market large enough to operate at an economic level. Such a plant would have to capture essentially 100 percent of the market in the area. Such a high capture percentage is not possible because:

1. Many of the fertilizer producers are integrated vertically and, therefore, would distribute their own product even if costs were somewhat higher.
2. Certain portions of the six state area can be more economically supplied from plants located in California, Washington, and Wyoming.
3. A Utah plant, if located on or near the Ute Reservation, would not have direct access to a railroad and therefore would be faced with extra handling and transportation charges.

D. LUMP CHARCOAL AND CHARCOAL BRIQUETS

During study of Uintah and Ouray Reservation natural resources, the Thiokol-Ute-BIA study team learned that large reserves of pinon pine and juniper woods exist there. The Reservation's BIA forester revealed that the area has approximately 450,000 acres of pinon pine and juniper trees, a large percentage of this resource with the potential for processing into charcoal, both lump and briquet.

During field timber density surveys of the southern extension of the Reservation, the forester and BIA program officer determined that 100,000 acres has an average of at least 4.2 tons of dried pinon pine per acre and 5.8 tons of green pinon pine and juniper per acre. Other areas of the Reservation are equally abundant in this resource.

Thiokol desired a professional opinion from an established charcoal producer and marketer to consider its research of the quality of Reservation pinon pine charcoal. One of the firms presently marketing charcoal products in the Intermountain Area, Keeter Charcoal Company of Branson, Missouri, indicated an initial interest in the possibility of charcoal being produced and briquetted on the Reservation. The initial concern was the quality of charcoal produced from pinon pine. A load of 10 cords of pinon pine was shipped to the Keeter Crickett, Arkansas, kilns where it was charred, then briquetted in the Branson, Missouri, plant. Chemical, physical, and general overall quality analyses were performed. Results of the evaluation and analysis of these tests made on the charcoaling of pinon pine are included in this study.

1. LITERATURE RESEARCH

A literature survey revealed that substantial research had been completed previously on all aspects of pinon pine and juniper cord wood and their harvest. Section VII, Bibliography, includes a summary of the literature reviewed. The most significant studies concerning ways to utilize these currently non-commercial forests had been made by the Bureau of Land Management (BLM) and Utah State University (USU). These studies, conducted from 1963 to 1966, and not yet published, include detailed up-to-date information. Major objectives of these studies were:

1. To determine harvesting costs of pinon pine and juniper cord wood.
2. To determine cost of producing charcoal from pinon pine and juniper wood.
3. To determine chemical and physical properties of charcoal produced from pinon pine and juniper wood.
4. To determine demand for bulk charcoal and charcoal briquets in the Western States.
5. To analyze the Western States charcoal industry.
6. To investigate potential of pinon pine as a fireplace fuel.

Utilizing the BLM - USU documents, Forest Service publications, and up-dated market research information, the following key facts were determined by the study.

Charcoal consumption has increased rapidly in the Western United States since 1945, with an average growth rate of 5 percent per year.

The majority of charcoal briquets are produced in the Eastern United States and shipped throughout the entire country. Charcoal briquets produced in California, Oregon, and North Dakota primarily supply the Intermountain and West Coast markets; however, large quantities of charcoal briquets are shipped into these markets from Eastern producers. Wholesale prices in the 1968 Salt Lake City market for ten pound bags varied from \$88 per ton to \$118 per ton. Prices were slightly higher on the West Coast. Harvesting of cordwood must be conducted very efficiently due to the high degree of competition presently existing from firms using low-cost wood waste, peach pits, walnut hulls, and lignite feed stocks in highly automated carbonizing retort furnaces. Such low cost raw materials place harvested charcoal briquet operations in a possible economic disadvantage unless highly efficient harvesting techniques are used.

Lump charcoal produced in Mexico from mesquite is bulk-shipped to Arizona where it is packaged in 40 pound bags and sold on the local market. It also is shipped to the substantial 10,000-ton-per-year California markets. The present source of supply from Mexico reportedly is unreliable so the possibility of penetrating that market exists to some extent. However, to operate a lump charcoal industry profitably on the Uintah and Ouray Reservation would require reliable delivery in bulk to California markets at a price equal to or lower than Mexico's \$60 per ton. Mexico's low cost waste utilization and more efficient and established production methods realistically appear to be distinct competitive advantages.

The following employment levels could be projected for efficient lump charcoal and charcoal briquet operation on the Uintah and Ouray Reservation.

1. Potential for a 5,000 ton/year lump charcoal industry - 40 manyears/year;
2. Potential for a 5,000 ton/year charcoal briquet industry - 50 manyears/year.

Proportionate employment levels could be projected for combinations of different levels of production in these industries. Profits would increase considerably with proportionately higher wage levels. Greater utilization of labor-saving harvesting and processing equipment would tend to eliminate some of the hand labor.

Capital investment required for facilities and equipment for these industries would be approximately \$9,000 to \$12,000 per income producing job; a very favorable investment figure. For example, the chemical industry estimates a minimum investment of \$100,000 per job, and this figure sometimes reaches \$200,000 per job.

2. STUDY CRITERIA

Criteria used in this analysis of marketing the Reservation's abundant supply of pinon pine wood as charcoal, both in lump and briquet forms, are described in this subsection. These criteria were derived from the extensive literature research and personal investigations completed by the Thiokol-BIA-Ute study team.

3. CHARCOAL FROM PINON PINE

Pinon pine, a very dense softwood, actually compares favorably with the light hardwoods. In analysis of yield calculations, conducted by Keeter Charcoal Company, a weight of 3,000 pounds per cord was

used as the weight of wood loaded into kilns. The ten measured cords of the pinon pine burned yielded 6,100 pounds of raw charcoal, requiring 3.3 cords of wood to make one ton of charcoal.

Estimated manhours/cord for harvesting pinon pine:

<u>Operation</u>	<u>Estimate (manhours)</u>
Felling, limbing, and bucking	4.00
Slash disposal	0.80
Loading, hauling to kilns, and unloading	1.30
Splitting and piling (only oversize cordwood)	<u>0.10</u>
Subtotal	6.20
Labor costs @ \$1.70/hour (average)	\$10.54/cord

Estimated costs of materials, supplies, maintenance, and depreciation per cord:

<u>Item</u>	<u>Estimate (\$/cord)</u>
Power saws	0.50
Wood truck	0.50
Power splitter	0.10
Other (axes, tools, records, etc.)	<u>0.20</u>
Subtotal	1.30

Employee benefits, insurance, and contingencies per cord:

<u>Item</u>	<u>Estimate (\$/cord)</u>
Workmen's compensation and employer's liability	0.35
Insurance and fees	0.30
Employee benefits	0.20
Contingencies (weather, stoppages, abnormal repairs)	<u>0.40</u>
Subtotal	1.25

Total harvesting costs per cord:

<u>Item</u>	<u>Estimate (\$/cord)</u>
Harvesting operations	10.54
Materials, supplies, etc.	1.30
Benefits, insurance, and contingencies	<u>1.25</u>
Total	13.09

Stumpage and road maintenance costs are not included. Not considered also are possible range improvement values (up to \$10 per acre in potentially productive range areas) which could be assumed a valid factor where the cleared land can be transformed into good grazing land by cultivation and seeding of range grasses. This credit possibly could be gained under contract by those conducting the wood harvesting operations.

Estimates of equipment costs assume acquisition of all new equipment. If surplus equipment can be obtained from the government, considerable savings can be realized. Also, it is assumed that harvesting crews will commute daily from their homes to the harvesting areas. If not, it will be necessary to establish forest area camp living for them. Approximately \$20,000 additional funds will be required to establish adequate facilities.

A 20 percent charcoal yield factor from pinon pine wood has been used to estimate costs. Based on this 20 percent factor, 3.3 cords at 3,000 pounds per cord, or 4.95 tons, of cordwood will be required in the kiln for each ton of charcoal produced.

Total harvesting costs per ton of charcoal produced are:

3.3 cords of wood/ton at \$13.09/cord of wood = \$43.20/ton.

4. LUMP CHARCOAL ANALYSIS

a. Market Analysis--Considerable data compiled by Utah State University for the Bureau of Land Management and the State of Utah has been studied to determine the feasibility of producing and marketing lump charcoal from pinon pine. Analysis of this information and additional U. S. Forest Service reports, supplemented by direct contact market research, indicates that a market for lump charcoal exists. Briquet producers are unable to fill this need because of the nature of raw material feedstocks. The present lump charcoal market

(approximately 10,000 tons per year in California) is presently supplied from unreliable Mexican sources and the market can be penetrated to some extent. Calculations in this study are based on a 5,000 ton per year operation. The estimated facility, equipment, and operating capital required for a facility this size are presented in Table VI.

TABLE VI

CAPITAL REQUIREMENTS--5,000 - TON/YEAR
BULK CHARCOAL PRODUCTION FACILITY

	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Site Development and Facilities</u>		
Forest Camp - grading, sidings, sanitation, and utility systems	---	\$ 3,000
Plant Site - grading, sidings, fencing, blacktop, utility systems, and buildings	---	25,000
<u>Harvesting Equipment</u>		
Chain and Reciprocating Saws (16)	\$ 450	\$ 7,200
Circular Saws (3)	2,500	7,500
Belt Type Loaders (4)	2,500	10,000
Lift Loaders (2)	4,500	9,000
2½ Ton Dump Trucks (6)	7,000	42,000
¾ Ton Pick-Up Trucks (4)	3,000	12,000
Misc. Hand Tools	---	2,000
Air Compressor	800	800
Electric Generator	---	2,000
<u>Kilns (40)</u>	3,000	120,000
<u>Truck Scales</u>	---	8,000
Subtotal		\$248,500
Operating Capital		125,000
Total Capital Required		<u>\$373,500</u>

b. Sales and Costs--Table VII is a summary of a preliminary analysis to analyze estimated sales and costs for a 5,000-ton/year bulk lump charcoal operation.

TABLE VII

SALES AND COST ESTIMATES FOR A
5,000 - TON/YEAR
BULK LUMP CHARCOAL PRODUCTION FACILITY

	<u>Per Ton</u>
<u>Sales</u>	\$ 60.00
<u>Costs</u>	
Harvesting	43.20
Charcoaling	<u>27.44</u>
Subtotal	\$ 70.64
Administrative and Indirect Costs (12% sales)	<u>7.20</u>
Subtotal	\$ 77.84
Transportation to California	<u>15.00</u>
Total Delivered Cost in Bulk	\$ 92.84
<u>Summary</u>	
Gross Sales	\$ 60.00
Less Total Delivered Cost	<u>92.84</u>
Gross Loss	\$(32.84)

NOTE: The present low price of Mexican lump charcoal in the California market (\$60.00) and the relatively high cost of harvesting and charcoaling of the pinon pine (\$70.64) are substantiated by information compiled by EDA. The low market price must substantially improve and more efficient harvesting and charcoaling methods be employed before a profitable venture can be established.

5. CHARCOAL BRIQUET ANALYSIS

a. Market Research--Surveys made in Utah and Colorado indicated that estimates made by Utah State University researchers in 1965 were approximately correct. All sources indicated the market to be growing at a rate of approximately five percent per year. Based on the 1965 data and the five percent annual growth, the current charcoal briquet market in the five-state Intermountain Area is as shown in Table VIII.

TABLE VIII
FIVE-STATE CHARCOAL BRIQUET SALES
1965 AND 1968

	Sales (Tons)	
	1965	1968
Utah	2,000	2,310
Colorado	4,600	5,313
New Mexico	1,615	1,865
Arizona	3,560	4,112
Nevada	900	1,040
Total	12,675	14,640

The major part of the charcoal briquet supply is imported into the Intermountain Area from east of the Mississippi. The nearest supply comes from as far away as North Dakota. Figure 1 shows locations of the major U. S. charcoal briquet producers as of July 1, 1968.

A survey of the Salt Lake City area that included over 25 percent of the 1968 charcoal market showed distributor cost, retail cost, and consumer prices. Results of the survey indicate there are three basic types and price ranges for charcoal briquets and that materials used for making them vary from hardwood to waste products and lignite. Type I charcoal, made of the best grade hardwood, is manufactured by a firm that has an established reputation for superior quality. Type II charcoal is manufactured from hardwood but does not have the same reputation for high quality as Type I. Type III charcoal is manufactured from lignite.

Table IX shows examples of wholesale prices for each type of charcoal briquet.

LOCATION OF MAJOR CHARCOAL BRIQUETTE PLANTS*

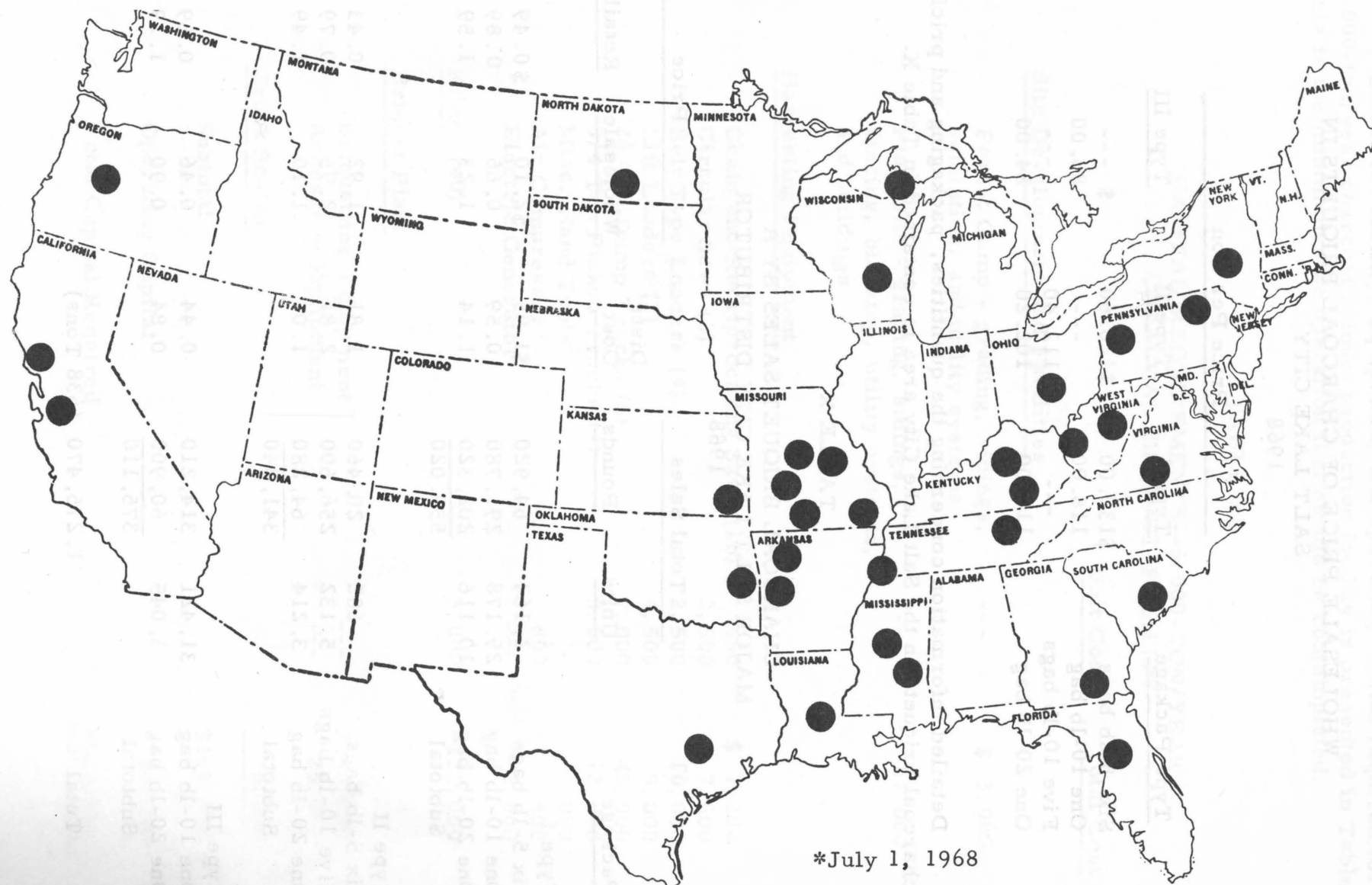


Figure 1. Major U. S. Charcoal Briquet Producers

TABLE IX

WHOLESALE PRICE OF CHARCOAL BRIQUETS IN
SALT LAKE CITY
1968

<u>Type Package</u>	<u>Price Per Ton</u>		
	<u>Type I</u>	<u>Type II</u>	<u>Type III</u>
Six 5-lb bags	\$130.00	\$120.60	\$ ---
One 10-lb bag	118.00	---	88.00
Five 10-lb bags	---	112.40	---
One 20-lb bag	114.00	102.20	84.00

Detailed information concerning the quantities, packaging and pricing of charcoal briquets in the Salt Lake City area is contained in Table X.

TABLE X

CHARCOAL BRIQUET SALES BY A
MAJOR SALT LAKE CITY DISTRIBUTOR
1968

	Total Sales			Price	
<u>Package</u>	<u>Units</u>	<u>Pounds</u>	<u>Distr Cost</u>	<u>Wholesale</u>	<u>Retail</u>
Type I					
Six 5-lb bags	2,164	64,920	\$1.95	\$2.10	\$0.49
One 10-lb bag	29,178	291,780	0.59	0.66	0.89
One 20-lb bag	10,116	202,320	1.14	1.23	1.59
Subtotal		559,020			
Type II					
Six 5-lb bags	682	20,460	1.81	1.92	0.43
Five 10-lb bags	5,132	256,600	2.81	2.95	0.79
One 20-lb bag	3,214	64,280	1.03	1.10	1.49
Subtotal		341,340			
Type III					
One 10-lb bag	31,421	314,210	0.44	0.46	0.69
One 20-lb bag	3,045	60,900	0.84	0.90	1.19
Subtotal		375,110			
Total		1,275,470	(638 Tons)		

Estimated facility, equipment, and operating capital required for a 5,000-ton/year charcoal briquet production facility is presented in Table XI. This is the minimum size operation that should be contemplated.

TABLE XI
CAPITAL REQUIREMENTS--5,000-TON/YEAR
CHARCOAL BRIQUET FACILITY

	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Site Development and Facilities</u>		
Forest Camp - grading, sidings, sanitation, and utility systems	---	\$ 3,000
Plant Site - grading, sidings, fencing, blacktop, utility systems, and buildings	---	61,000
<u>Harvesting Equipment</u>		
Chain and Reciprocating Saws (16)	\$ 450	\$ 7,200
Circular Saws (3)	2,500	7,500
Belt Type Loaders (4)	2,500	10,000
Lift Loaders (2)	4,500	9,000
2½ Ton Dump Trucks (6)	7,000	42,000
¾ Ton Pickup Trucks (4)	3,000	12,000
Misc. Hand Tools	---	2,000
Air Compressor	800	800
Electric Generator	---	2,000
<u>Kilns (40)</u>	3,000	120,000
<u>Briquet Plant</u>		
Briquetting Equipment	---	\$150,000
Accessory Equipment	---	25,000
<u>Truck Scales</u>		<u>8,000</u>
Subtotal		\$459,500
Operating Capital		<u>160,000</u>
Total Capital Required		<u>\$619,500</u>

b. Sales and Costs--Table XII is a summary of estimated sales and costs for a 5,000-ton/year charcoal briquet operation.

TABLE XII

SALES AND COST ESTIMATES FOR A
5,000 - TON/YEAR
CHARCOAL BRIQUET PRODUCTION FACILITY

	<u>Per Ton</u>
<u>Sales</u> (in 10-lb. bags)	\$112.40
<u>Costs</u>	
Harvesting	\$ 43.20
Charcoaling	27.44
Briquetting	25.00
Bagging	10.00
Subtotal	\$105.64
Administrative and Indirect Costs (15% sales)	16.86
Subtotal	\$122.50
Transportation (average - to Salt Lake and Denver)	\$ 6.00
Total Delivered Cost	\$128.50
<u>Summary</u>	
Gross Sales	\$112.40
Less Total Delivered Cost	128.50
Estimated Gross Loss	\$(16.10)

NOTE: It is evident that more efficient harvesting and charcoaling methods must be employed if such a venture is to be profitable.

6. QUALITY ANALYSIS OF PINON PINE CHARCOAL

One of the primary concerns relating to production of charcoal from the pinon pine reserves located on the Uintah and Ouray Indian Reservation has been the quality of the product. Keeter Charcoal Company of Branson, Missouri, recognizing the importance of this factor, offered to make an independent quality determination of ten cords of the pinon pine cordwood. This quantity was loaded into one of Keeter's Missouri-type kilns, charred and then made into briquets for final analysis. Keeter's findings are:

1. Charcoal yield from the ten measured cords of pinon pine was 610 lb/cord, requiring 3.3 cords to make one ton of charcoal.
2. Yield of Ozark hardwood is approximately double that of the pinon pine per measured cord of wood.
3. Harvesting costs/acre are such an indeterminate factor that payment of approximately \$10 per cord delivered into the kilns is recommended.
4. Pinon pine does make a desirable raw charcoal; however, the yield per measured cord very likely makes it prohibitive for charcoal.

Results of the laboratory analysis and observations by Keeter Charcoal Company are presented in Figures 2 and 3.

KEETER CHARCOAL COMPANY

BRANSON, MISSOURI

P. O. BOX 653

March 12, 1969

OFFICE:

EDison 4-2484

EDison 4-3921 (Manager's Res.)

PLANT:

EDison 4-5842

Mr. Galen D. Dawson
Thiokol Chemical Corporation
Economic Development Operations
3340 Airport Road
Ogden, Utah 84402

Dear Sir:

Enclosed please find a copy of the analysis which we had run on pinion pine charcoal briquets. Pinion pine does make a desirable raw charcoal, however, the yield per measured cord of wood would very likely make it prohibitive from use for charcoal.

The ten measured cords of pinion pine that we burned yielded 6,100 lbs. of raw charcoal, approximately 600 lb. per cord of wood. That yield would take 3 1/3rd cord of wood to make one ton of charcoal compared with 1.6 cord of Ozark hardwood per ton of raw charcoal. The pinion pine weighs only approximately 3,000 lbs. per cord, whereas, Ozark hardwood weighs approximately 5,130 lbs.

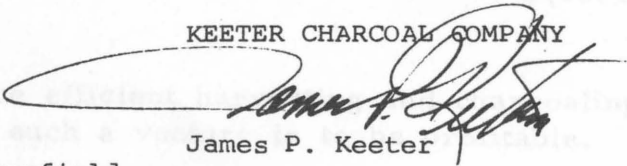
The cost per acre would vary so much in cords of wood that there would be no way of estimating the cost of harvesting per acre.

We pay \$10.00 per cord delivered into our kilns. We have never had any wood cut by the hour. Some inexperienced people have tried cutting wood by the hour, against our recommendations, but have never been successful at it. If they stayed in the cord wood business they ended up paying for it by the cord.

We are indeed sorry we have been so slow getting this information to you, however, we do not consider ourselves an authority on charcoal production from pinion pine since we have only been exposed to such a small amount. If we can be of any further help, please let us know.

Yours very truly

KEETER CHARCOAL COMPANY



James P. Keeter

JPK:Z

cc: Vernon C. Bottenfield

Figure 2

ANALYSIS OF
COAL
PETROLEUM PRODUCTS
WATER
FOOD PRODUCTS
INSECTICIDES
HERBICIDES
VETERINARY MEDICINES
CHEMICAL PRODUCTS

CERTIFICATE OF COAL ANALYSIS INDUSTRIAL TESTING LABORATORY

ANALYTICAL AND CONSULTING CHEMISTS

TELEPHONE VICTOR 2-7015
804 WOODSWETHER ROAD
KANSAS CITY, MISSOURI 64105

MEMBER:
AMERICAN SOCIETY FOR TESTING MATERIALS
AMERICAN CHEMICAL SOCIETY

DATE February 21, 1969 LABORATORY NUMBER 120-376

SAMPLE MARKED: Pinion Pine Charcoal Briquets

SUBMITTED BY: Keester Charcoal Company

Branson, Missouri

AS RECEIVED:		ANALYSIS	
MOISTURE	1.31	%	
ASH	7.20		
VOLATILE MATTER	30.86		
FIXED CARBON	60.63		
SULFUR	0.22		
HEAT OF COMBUSTION	11,416	B.T.U. PER L.B.	
DRY BASIS:			
ASH	7.30	%	
VOLATILE MATTER	31.27		
FIXED CARBON	61.43		
SULFUR	0.22		
HEAT OF COMBUSTION	11,568	B.T.U. PER L.R.	
FUSION POINT OF ASH		°F.	
FREE-SWELLING INDEX			

RESPECTFULLY SUBMITTED
INDUSTRIAL TESTING LABORATORY

FORM 16

By

Figure 3

7. PINON PINE FIREWOOD ANALYSIS

a. Market Research--Existing reports indicated a 1964 firewood market of 8,000 tons for the area comprised of Denver, Colorado; Albuquerque, New Mexico; Salt Lake City, Utah; Phoenix, Arizona; and Reno, Nevada.

Results of a preliminary survey by the Thiokol-BIA-Ute study team to verify the magnitude of the current Salt Lake City and Denver market areas indicated that they are larger than 1965 estimates, and are growing. Fireplaces are very popular in the region, and a high percentage of new homes have them. Pinon pine is by far the most popular firewood; so much so that most firewood dealers do not stock any other types of wood.

TABLE XIII

COMPARISON OF DENVER AND SALT LAKE FIREWOOD MARKETS

	Estimated Market (Tons)	
	1964	1968
Denver	2,000	4,450
Salt Lake City	1,800	2,520
Denver Area	---	(5,950)
Salt Lake City Area	---	(3,100)
Total (area)		9,050

With an effective marketing program, an efficient operation could penetrate this market 40 percent, or 3,600 tons.

Table XIV reflects the 1968 wholesale and retail prices of firewood in the Denver and Salt Lake City areas.

TABLE XIV
PRICES OF PINON FIREWOOD IN
DENVER AND SALT LAKE CITY
1968

Lot Size	Price (Per Ton)	
	Wholesale	Retail
<u>Salt Lake Area</u>		
500 lb.	---	\$40
1,000 lb	---	34
2,000 lb	\$ 20	32
<u>Denver Area</u>		
500 lb	---	52
1,000 lb	---	44
2,000 lb	24	42

Additional factors pertaining to these markets are:

1. Most firewood cutters and truckers operate only part time.
2. Sources of supply are undependable.
3. Early snows in the area make procurement of even a minimum supply difficult.
4. Many of the firewood dealers would be pleased to enter into firm contracts with a reliable supplier that can assure delivery.
5. Most pinon pine is transported more than 150 miles to market.

Estimated facility, equipment, and operating capital requirements for a 3,600-ton/year pinon pine firewood production facility are presented in Table XV

TABLE XV

CAPITAL REQUIREMENTS -- 3,600-TON/YEAR
PINON PINE FIREWOOD PRODUCTION FACILITY

	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Site Development and Facilities</u>		
Plant Site - grading, fencing, and storage shed	---	\$ 8,000
<u>Equipment</u>		
2½ Ton Trucks (4)	\$ 7,000	\$ 28,000
¾ Ton Pickup Truck	3,000	3,000
Belt Type Loaders (2)	2,500	5,000
Hydraulic Lift Loaders (2)	4,500	9,000
Self-Powered Circular Saw	2,500	2,500
Splitters (2)	2,500	5,000
Chain Saws (8)	450	3,600
Miscellaneous Hand Tools	---	1,000
Air Compressor	550	550
Electric Generator	1,000	1,000
Subtotal		\$ 66,650
Operating Capital		<u>39,000</u>
Total Capital Required		\$105,650

b. Sales, Costs, and Profits--Table XVI is a summary of anticipated sales, costs, and profits for a 3,600 ton yearly pinon pine firewood operation. A cost of approximately \$13.09 per ton (cord equals 2,000 pounds dry) is estimated to cut, trim, buck and transport the dry pinon to the wood lot. Sales and administration expenses are estimated at 12 percent of sales. Costs include allowance for repair, maintenance and depreciation of equipment. Cost of loading and transporting the wood to market is estimated at \$4 per ton to Salt Lake City (150 miles) and \$7 per ton to Denver (350 miles).

TABLE XVI

SALES, COSTS, AND PROFITS OF A 3,600-TON/YEAR
PINON PINE FIREWOOD PRODUCTION OPERATION

	<u>Sales (Tons)</u>	<u>Wholesale Price</u>	<u>Total Sales</u>
<u>Sales</u>			
Salt Lake City Area	1,200	\$20	\$24,000
Denver Area	2,400	24	57,600
Sales	3,600		\$81,600
<u>Costs</u>			
Harvesting (at \$13.09 per ton)			\$47,124
Administrative and Indirect Costs (12% sales)			9,792
Subtotal			\$56,916
Transportation (average \$6 per ton)			21,600
Total Delivered Cost			\$78,516
<u>Profit</u>			
Estimated Gross Sales			\$81,600
Less Total Delivered Cost			78,516
Gross Profit			\$ 3,084

CONCLUSIONS AND RECOMMENDATIONS

Conclusions presented here are based on the preceding information accumulated and analyzed during this economic development study of potential enterprises for the Ute Indian Tribe on the Uintah and Ouray Reservation.

Recommendations indicate the need for further cooperative efforts on the part of the Ute Indian Tribe, the Bureau of Indian Affairs, and interested industrial firms in planned economic development leading to sound tribal investments in profit-making enterprises that will provide jobs for presently underemployed tribal members.

A. CONCLUSIONS

Specific conclusions are based on the findings of the study team during this economic development effort.

1. World, national, and local chemical fertilizer markets presently are depressed since production over-capacity has led to large inventories, price discounting, and competitive marketing practices. Farmers in the Intermountain Area have not used urea fertilizers in the quantities they use other fertilizers. Urea as animal feed, greater than as fertilizer, is projected to increase continually. The projected 1972 61,000-ton-per-year urea rate of consumption in the Intermountain Area is not sufficient to justify a 200-ton-per-day (66,000-ton-per-year) plant since established producers still will maintain a share of the market.
2. Lump charcoal produced from pinon pine can be marketed on the West Coast at a rate of 5,000 tons per year. The price of the charcoal must meet the Mexican lump charcoal price if it is to gain acceptance and the source must be dependable. Efficient harvesting and charcoaling methods will be necessary to realize a satisfactory profit. Cost analysis indicated net losses would be incurred under present conditions.

3. Charcoal briquets produced from pinon pine and juniper can be marketed in such Intermountain Area markets as Salt Lake City and Denver at a volume of 3,500 tons per year, which is approximately 50 percent of the total 7,000 ton per year market. A 5,000 ton per year production rate is necessary, however, to maintain efficient briquetting processes. Competition from firms utilizing low cost wood waste and lignite feed stocks in processes utilizing the highly automated carbonizing retort furnace places harvested charcoal briquet operations at a possible economic disadvantage. Cost analysis indicated net losses would be incurred under present conditions.

4. Quality analysis of lump charcoal and charcoal briquets produced from pinon pine were conducted under production conditions by a top producer-marketer of charcoal briquets in an effort to compare the quality of pinon pine charcoal briquets with that of Ozark hardwood charcoal briquets. The pinon pine product proved to be inferior to the hardwood product in briquet form; however, the pinon pine lump charcoal obtained was of good quality with only one possible objectionable characteristic--the charcoal retains its pine resin odor and must be tested for consumer acceptance.

5. Pinon pine firewood can be marketed in Intermountain Area markets at a rate of 3,600 tons per year, which is approximately 40 percent of the total 9,000 ton per year market. Pinon pine is the most popular firewood and dealers are seeking dependable supply sources that will ensure delivery. A reliable plan for marketing Ute firewood would gain an even greater share of the market. Other forms of wood products such as cedar posts and particle board made from chips possibly could be processed following initial entry into the markets. Cost analysis indicated a marginal return under present conditions.

The following factors (locale, working conditions, culture) will have a direct influence on the economic development of the Uintah and Ouray Reservation.

1. Ute Indians love their land, their families, and their customs. The majority of them do not want economic development that will draw them away from their way of life and enjoyment of their privileges on the Reservation. The individual Indians who become more acculturated (approximately 400 of the 1,650 population) have an

established program to enable them to relocate with training and job opportunities.

2. Ute Tribal leaders, supported by BIA personnel, have a two-fold interest in economic development of the Reservation. First, they desire job-producing industries utilizing efficient, automated labor-saving equipment to correct the high, 60 percent rate of unemployment. Second, they are willing to invest tribal funds in a good industry to gain a suitable return on their investment. Initially, they would prefer to hold a minority interest in such an enterprise, with management and control by a private company.
3. Value of assets remaining to the Ute Indian Tribe at this time are substantial--1.1 million acres of surface area, mineral rights to 3/4 of the subsurface area of 1.25 million acres, over \$8 million security invested, and unadjudicated claims against the U. S. Government. On this basis, the net worth of each accredited Ute Tribal member is considerable.
4. The issue of "termination" is foremost in the minds of the Indian leaders. They question whether future progress will mean withdrawal of help that has made them more capable under BIA programs. This feeling is accentuated by the positive cooperative attitude exhibited by the present BIA Reservation superintendent and his staff in working with the Ute Tribe. In the mid-1950's and early 1960's, Public Law 671 resulted in termination of 490 mixed-blood members of the Ute Tribe under the theory that they have attained a level of education and sophistication equal to their non-Indian neighbors. In the termination process, a large percentage of the financial proceeds to the mixed-blood members were lost, and Tribal members feel that, under "termination," they again would lose such proceeds.
5. With the exception of farming, no individual Ute Indians operate their own businesses, and very few operate their own farms. More than 40,000 acres of irrigated Reservation farmland is not being cultivated. The short agricultural growing season is a problem; however, good cattle feed crops such as milo are in demand and could be raised on this land. The dairy business is highly successful in the Uintah Basin and is one in which individual Indian families could, with proper training and guidance, operate successfully.

B. RECOMMENDATIONS

The following specific recommendations are made after analysis of preceding conclusions.

1. The Ute Tribe should employ a full-time economic development professional to work with tribal and BIA Economic Development Reservation action groups. Experienced consultants should be employed, for periodic assignments, to perform certain technical evaluations. Federal aid should be sought for the accomplishment of programs that benefit both the Ute Indian Tribe and the United States Government.
2. Due to the presently depressed world, national, and Intermountain Area fertilizer markets, the Ute Tribe should not enter into a urea fertilizer enterprise under existing conditions. A continuing surveillance of these markets should be maintained, however, to assure awareness of any significant changes in Intermountain Area farming and livestock feeding techniques.
3. Due to the competitive disadvantages facing the Ute Tribe in both the lump charcoal and charcoal briquet markets, it should not enter into a pinon pine charcoal enterprise under existing conditions. A continuing surveillance of these markets should be maintained, however, to assure awareness of higher market prices and the possibility of utilizing more efficient timber harvesting and charcoaling methods.
4. Support of local, county, and state officials should be continued in efforts to develop better transportation systems for the Uintah Basin, and to examine all possibilities for bringing a railroad spur into the area. "Piggy-back" and containerized shipping techniques should be investigated to determine means of removing some of the present disadvantages of remote transportation.
5. Present planning efforts being conducted in cooperation with the BIA should be intensified to prepare for greater utilization of the natural resources available on the Reservation. A comprehensive economic mineral and natural resource survey is recommended to determine the extent of hydrocarbon and other mineral deposits there. A plan should be developed for a period of five years projected into the 1980's.

KEY PERSONNEL

The team that conducted this study was composed of the following representatives of Thiokol Chemical Corporation, the Bureau of Indian Affairs, and the Ute Indian Tribe.

Galen D. Dawson
Study Director
Thiokol Chemical Corporation

Vernon C. Bottenfield
Bureau of Indian Affairs

Clifford Duncan
Ute Indian Tribe

Henry A. Reinert
Thiokol Chemical Corporation

Lawrence C. Taylor
Market Research
Thiokol Chemical Corporation -
Utah State University

Vitae of these team members are presented on the following pages.

GALEN D. DAWSON
Study Director
Thiokol Chemical Corporation

As director, Mr. Dawson has been responsible, through Robert L. Marquardt, Thiokol Vice President, to the Bureau of Indian Affairs and the Ute Tribal Council for the successful direction and coordination of this Uintah and Ouray Reservation industrial development study.

As development engineer with Thiokol's Economic Development Operations since 1966 he has been responsible for the design, construction, and equipage of the company's operating divisions at Clearfield, Utah, Roswell, New Mexico, and San Antonio, Texas. For seven years prior to that he assisted in designing, building, and equipping Thiokol's major solid propellant rocket R & D and production facility near Brigham City, Utah.

Mr. Dawson worked for Phillips Petroleum Company for 11 years previously as a refinery and facilities engineer. He served in the U. S. Army during World War II and the Korean conflict.

Mr. Dawson received a B.S. degree in civil engineering from Kansas State College (1948) and a B.B.S. degree in business administration from Baylor University (1957).

VERNON C. BOTTENFIELD
Market Research Specialist

Mr. Bottenfield was assigned membership on the study team by the Uintah and Ouray Reservation Programs Office in Fort Duchesne, Utah. As BIA Reservation Programs Officer, he is responsible for most phases of economic and social development of the Reservation and its inhabitants. As one of two staff members he advises the Reservation Superintendent on these matters.

Mr. Bottenfield also has served as BIA resources development officer in Montana and Alaska from 1962 to 1967. He was a geographic intelligence researcher for a year with the federal Area Analysis Intelligence Agency in Washington, D. C. There he researched physical geography of Central Africa, and social and physical geography of parts of the Far East. He also briefed and debriefed U. S. Army personnel and attaches during this period.

In addition, Mr. Bottenfield has had extensive experience as a cartographer with federal government agencies and as a geography instructor at the University of Utah. He also has experience as an oceanographic aide and soils engineer in government and industry, and a biographical aide in forestry. He served in the U. S. Army during the Korean conflict.

Mr. Bottenfield has a B.S. degree in general science from Colorado State University. He also did undergraduate studies at Northwestern University. He has an M.A. degree in geography from the University of Hawaii, and has done predoctoral work in geography at the Universities of Kansas and Illinois.

CLIFFORD DUNCAN

Researcher Specialist and Tribal Member

Mr. Duncan, a Ute Indian and member of the Ute Tribal organization, very successfully researched Reservation resources and economic factors while acting as intermediary with the Ute Tribal Council during the program.

As a long time worker for the Ute Tribe and the Bureau of Indian Affairs, Mr. Duncan has served as an assistant engineer, a surveyor aide, and a custodial supervisor. He also has been an assistant nurse at the Veterans Administration Hospital in Salt Lake City.

Mr. Duncan is a graduate of Union High School in Roosevelt, Utah. In 1965, he received extensive Office of Economic Opportunity sponsored youth camp and small business management training in New York and Arizona.

HENRY A. REINERTH
Finance and Administration

Mr. Reinerth directed financial and administrative efforts in this development study. He was responsible directly to the Study Director.

Mr. Reinerth was temporarily on loan from Thiokol's Clearfield Division where he was Associate Director of Administration, responsible for contract administration and negotiation, purchasing, material control, cost analysis, financial controls, and budgets.

Before joining Thiokol, Mr. Reinerth was employed by the U. S. Air Force where he directed procurement, negotiation, and administration of major defense hardware contracts involving hundreds of millions of dollars. He also worked in the sales organizations of several major concerns, including American Airlines and Armour Company. He is a veteran of Navy service.

Mr. Reinerth received his college training at Ohio State University.

Extensive experience in his many business and academic pursuits in the Intermountain Area made Mr. Taylor well qualified to advise the study on the many aspects of this study. Thus, the team had access to great quantities of little known available information about the Uintah and Ouray Reservation, and about previous studies made there.

BIBLIOGRAPHY

Many sources of information were researched by the Thiokol-BIA-Ute study team during this investigation. The sources included research of existing literature, coordination with representatives of companies having experience in the area of interest, and consultation with persons having direct knowledge of the Reservation and the products evaluated. The most prominent of these sources include:

1. EXISTING LITERATURE

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Essex, Burton L. and Warner, John R.: Trends in the Wisconsin Charcoal Market. Forest Service, U. S. Department of Agriculture Station Paper No. 80, March 1960.

2. COMPANIES CONTACTED

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M. W. Kellogg Company

Division of Pullman Incorporated

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New York, New York 10017

Chemico

Chemical Construction Corporation

320 Park Avenue

New York City, New York 10022

C & I Girdler, Inc.

256 McCullough Street

Cincinnati, Ohio 45226

Foster Wheeler Corporation

110 South Orange Avenue

Livingston, New Jersey 07039

Wasatch Chemical Company

2225 South 5th East

Salt Lake City, Utah

Pax Company (Utah Farmers Coop)

580 West 13th South

Salt Lake City, Utah

Pillsbury Feed Plant

2805 Glove Mills Avenue

Ogden, Utah

R. J. Wight Feed Company

860 West 24th Street

Ogden, Utah

F. P. Nielson Feed Company
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Tremonton, Utah

Intermountain Farmers
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Salt Lake City, Utah

Western Nitrogen Company, Inc.
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Salt Lake City, Utah 84101

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Keeter Charcoal Company
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Wilkes-Barre, Pennsylvania

Bartlett-Snow-Pacific, Inc.
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San Francisco, California 94110

National Engineering Company
549 West Washington Boulevard
Chicago, Illinois 60606

Komarck-Greaves Company
2941 Mozart Street
Chicago, Illinois

Nichols Engineering and Research Corporation
150 Williams Street
New York City, New York

State Industrial Promotion Commission
167 Social Hall Avenue
Salt Lake City, Utah

First Security Bank of Utah
79 South Main Street
Salt Lake City, Utah

Commercial Security Bank
2491 Washington Boulevard
Ogden, Utah

U. S. Department of Labor
Manpower Administration
125 South Main Street
Salt Lake City, Utah

Zion First National Bank
One South Main Street
Salt Lake City, Utah

Walker Bank
Second South & Main Street
Salt Lake City, Utah

Small Business Administration
2237 Federal Building
125 South State Street
Salt Lake City, Utah 84111

Utah Industrial Services Agency
118 Stewart School
University of Utah
Salt Lake City, Utah 84112

"K" Mart Discount Stores
Division of S. S. Kresge Company
4670 South 900 East
Salt Lake City, Utah

Utah Wholesale Grocery Company
1659 Industrial Road
Salt Lake City, Utah

Kennecott Copper Corporation
Kennecott Building
Salt Lake City, Utah

Van Waters and Rogers - Chemical Wholesalers
650 West 8th South
Salt Lake City, Utah

American Smelting and Refining
Crandall Building
Salt Lake City, Utah

Sears, Roebuck & Company
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Salt Lake City, Utah

Eimco Corporation
537 West 6th Street
Salt Lake City, Utah

Curtis Coal & Wood Company
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Salt Lake City, Utah

Safeway Stores
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Salt Lake City, Utah

Uintah Freightways
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Utah Mining Association

Salt Lake City, Utah

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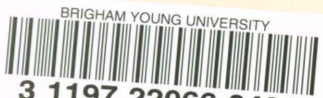
Mr. Edward J. Hoffman, Acting Head
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Mr. E. S. Kotick
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State Capitol Building
Salt Lake City, Utah



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ECONOMIC DEVELOPMENT ADMINISTRATION

TECHNICAL
ASSISTANCE
PROJECT

U.S. DEPARTMENT OF COMMERCE

STUDY OF A
UINTAH AND OURAY RESERVATION
UREA FERTILIZER MANUFACTURING
PLANT AND ECONOMIC
DEVELOPMENT POTENTIAL OF A
CHARCOAL INDUSTRY

Contract No. 8-35297

Final Report.

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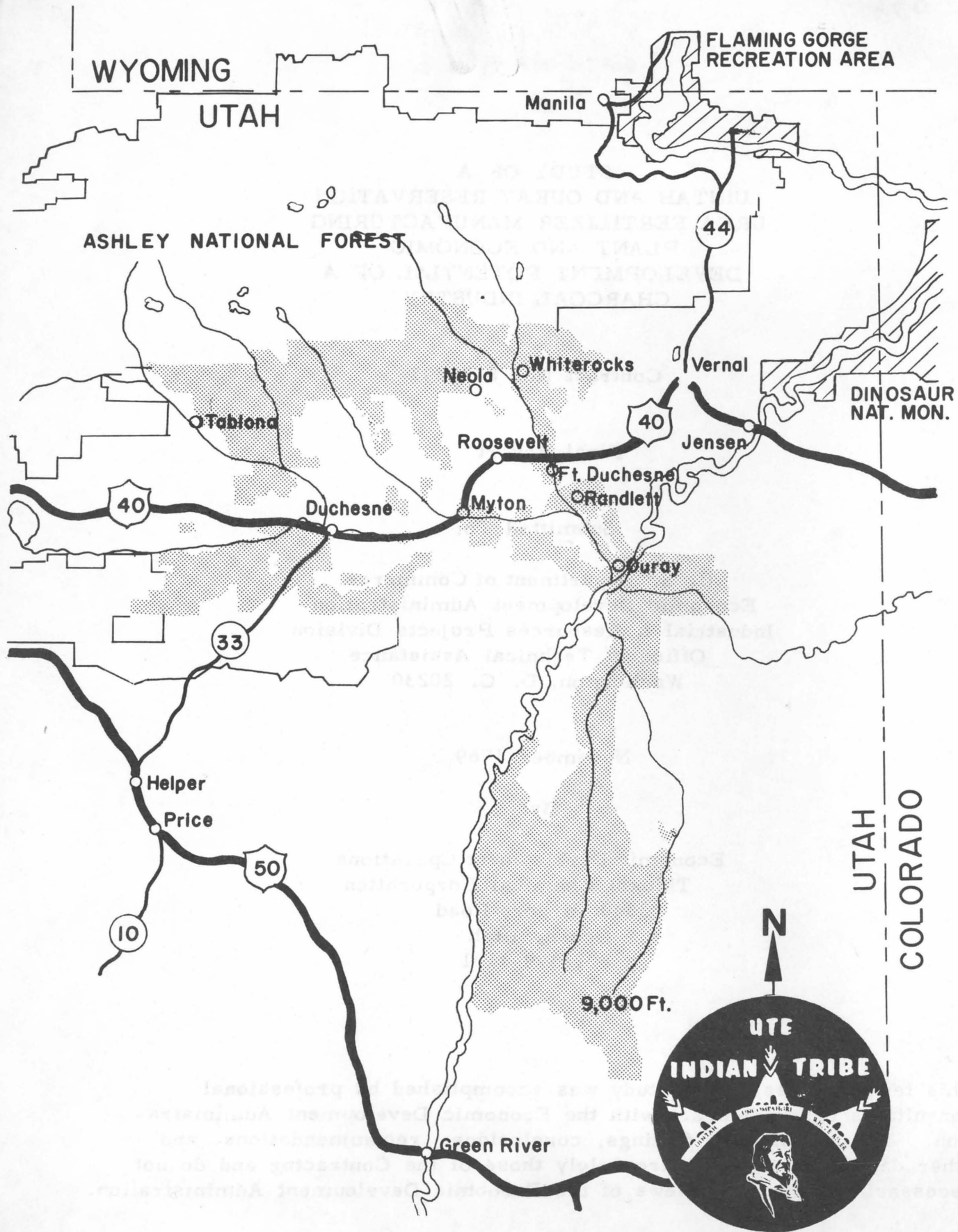
U. S. Department of Commerce
Economic Development Administration
Industrial & Resources Projects Division
Office of Technical Assistance
Washington, D. C. 20230

November 1969

By:

Economic Development Operations
Thiokol Chemical Corporation
3340 Airport Road
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This technical assistance study was accomplished by professional consultants under contract with the Economic Development Administration. The statements, findings, conclusions, recommendations, and other data in this report are solely those of the Contractor and do not necessarily reflect the views of the Economic Development Administration.



Frontispiece-- Uintah and Ouray Reservation

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STUDY: UINTAH AND OURAY RESERVATION UREA FERTILIZER
MANUFACTURING PLANT AND ECONOMIC DEVELOPMENT POTENTIAL
OF A CHARCOAL INDUSTRY

INTRODUCTION AND SUMMARY

This final report is submitted by the Economic Development Operations of Thiokol Chemical Corporation to the Office of Technical Assistance, Economic Development Administration (EDA), U. S. Department of Commerce, in compliance with the provisions of Contract No. 8-35297, as amended. Study objectives, scope, methodology, findings, conclusions, and recommendations are described.

Basic information for this study was generated on the Uintah and Ouray Indian Reservation of Eastern Utah during intensive on-site and area market research, natural resource studies, personnel and plant location surveys, transportation studies, financial analyses, and training requirements considerations. Continuing study of economic implementation factors and compilation of other relevant data have followed preparation of this study. The study efforts were cooperatively developed and are jointly concurred in by Thiokol Chemical Corporation, the Ute Indian Tribe, and the Bureau of Indian Affairs (BIA).

During the early months of 1967, Thiokol Chemical Corporation conducted preliminary economic and marketing studies of basic analytical data to determine the feasibility of developing a urea fertilizer and allied products chemical complex in the Intermountain Area. A tentative agreement was formulated at that time with a regional fertilizer distributor for contract purchase of an average production of 125 ton per day, 45,625 ton per year, of fertilizer grade urea. The plant location planned was Ogden, Utah; however, various factors seemed to qualify the Uintah and Ouray Reservation as an ideal location for this type of plant. These factors included availability of natural resources, Ute Tribal desires to operate Indian-owned enterprises, and a high Reservation unemployment problem. Thiokol personnel held discussions with BIA personnel and the Ute Business Committee at the Ute Tribal headquarters in Fort Duchesne, Utah. Thiokol's previously prepared analysis of the advisability of establishing a urea fertilizer and allied products complex were reviewed during these meetings. The Tribal Business Committee expressed genuine interest and, with BIA concurrence, agreed that a new concerted feasibility study should be initiated prior to commitment of any Tribal funds. A proposal for EDA technical assistance, Urea Fertilizer and Allied Products Manufacturing Plant Study,

thus was prepared by the BIA, Ute Tribe, and Thiokol Chemical Corporation study team and was submitted to the Economic Development Administration.

Following the submittal of the technical assistance proposal, Thiokol conducted a continuing market analysis until commencement of the EDA project in June 1968. During this period of market analysis, fertilizer market conditions changed considerably and by mid-1968 industrial capacity of production of urea and other chemical fertilizers exceeded demand to the extent that major producers were drastically lowering prices to eliminate competition. Thus, it was not possible to negotiate a firm agreement with the potential Intermountain Area fertilizer distributor for a projected 125-ton-per-day output of the planned 200-ton-per-day plant. Thiokol, BIA, and Ute Tribe members of the study team then decided that initial studies should concentrate in researching the urea and allied product markets specifically within the Intermountain Area.

Results of the market research indicated that the desired goal, positive economic development resulting in creation of employment for members of the Ute Indian Tribe, could not be attained if such development was limited to urea and related chemical fertilizers. A basic recommendation was made then that the study effort be broadened to include production and marketing of charcoal, firewood, and other wood products to utilize the vast reserves of pinon pine and juniper on the Reservation. A preliminary study of the wood products industry revealed that, at best, this type of industry would provide only limited impact on the unemployment problems of the Ute Indians. Thiokol completed the original development study by making a comprehensive examination of the feasibility of establishing a charcoal industry on the Reservation utilizing the pinon pine and juniper resources available in the area. The Ute Business Committee adopted a resolution stating its intent to establish a Ute Tribal pinon pine wood products enterprise if further studies indicated it to be economically feasible.

To finalize the study, Thiokol utilized the following methodology for examining the feasibility of producing and marketing charcoal briquets in the Intermountain and West Coast regions. This method consisted of contacting the four major firms heavily involved in marketing of charcoal in these areas, supplying them with the study information developed to date, and obtaining from them independent viewpoints concerning the economic value of pinon pine charcoals. The firms were asked to base their opinions on independent and factual information available to them. Immediate implementation would be the key

to this approach. If results were positive, and one of the firms indicated strong interest, the natural result would be for Thiokol to act as an intermediary until the interested firm independently negotiated such details with the Ute Tribe as Tribal participation, capital investment agreements, operating functions, and implementation.

Of the four firms contacted, two initially expressed enthusiasm for the possibility of charcoal being produced and briquetted on the Uintah and Ouray Indian Reservation. Their first concern was quality of charcoal produced from pinon pine wood. They also were concerned about harvesting and production costs. One of these firms expressed the potential of a yearly market of up to 5,000 tons of lump charcoal in California markets. The other firm conducted quality analyses on the pinon pine charcoal.

In summation, it was found that the establishment of a charcoal briquetting industry, including production and marketing of lump charcoal, was not feasible as a significantly strong enterprise to bring immediate and meaningful economic development to the Uintah and Ouray Indian Reservation. This conclusion was based on the following factors.

1. Significant competitive disadvantage in the West Coast market with Mexican lump charcoal prices.
2. Significant competitive disadvantage in Intermountain states (Salt Lake City and Denver) with producers utilizing:
 - a. Low-cost efficient production processes.
 - b. Low-cost wood waste and lignite feed stocks in highly automated carbonizing retort furnaces.
3. Significant competitive disadvantage with Ozark hardwood charcoal briquets with respect to quality.
4. Significant competitive disadvantage generally in that consumer acceptance of pinon pine charcoal briquets would have to be substantiated due to possible objectionable characteristics of this type of charcoal to retain its pine resin odor. Establishment of consumer acceptance market testing is both costly and time consuming with highly unpredictable results.
5. Significant competitive disadvantage with respect to resource problems; timber density and comparatively low yield of charcoal per cord of processed pinon pine.

Discussions with spokesmen of firms presently involved in marketing of charcoal briquets in the Intermountain and West Coast Areas were of considerable value in developing independent evaluations based on the business aspects of charcoal briquet production and marketing. The experience of two of these firms, C. B. Hobbs Corporation and Keeter Charcoal Company, was particularly beneficial to the study team in helping to finalize the conclusions.

C. B. Hobbs Corporation officials visited the projected Reservation timber harvesting areas. Discussions with the Ute Tribe, BIA, and Thiokol personnel concerning a charcoal production and marketing enterprise on the Uintah and Ouray Reservation led to a recommendation to concentrate on lump charcoal marketing on the West Coast, similar to that being shipped from Mexico. Hobbs was concerned about the low density of pinon pine and juniper compared to normal hardwood timber harvesting areas and recommended that automated harvesting and charcoaling equipment be utilized to eliminate costly and inefficient manual processes.

Keeter Charcoal Company expressed an initial concern pertaining to the quality of charcoal produced from pinon pine and offered to make an independent analysis. Pinon pine was shipped from the Reservation to Crickett, Arkansas, loaded into Missouri-type kilns, charred, and made into lump charcoal and briquets for further analysis. The analysis revealed that the charcoal yield per measured cord of pinon pine would very likely make this wood prohibitive for establishing a charcoal industry for the Utes.

The analytical details acquired during this study with respect to the Reservation, its natural resources, a potential development of industries with urea fertilizer, and pinon pine-juniper wood charcoal products follows, including conclusions and recommendations.

ANALYSIS AND RESULTS

In analyzing the economic potential of the Uintah and Ouray Ute Reservation, the Thiokol-BIA-Ute study team first determined the practicability of locating an urea fertilizer and allied products manufacturing plant in or near the area. Results indicated that since the production capacity for urea and other chemical fertilizers exceeds existing demands, successful industrialization is not possible if effort is limited to just these products.

Reservation industrialization possibilities other than urea were analyzed in this study, as were the environmental, marketing, and resource factors affecting such possibilities. Results of these analyses are detailed in this report section.

A. RESERVATION FACTORS

Analysis of the Reservation included such important local factors as population, labor supply, possible industrial parks, developments planned, tribal investments, existing enterprises and businesses, educational opportunities, medical care facilities, law enforcement of the area, recreation, transportation, water supply, waste disposal, and natural resources, including electrical power and natural gas. Findings of each are presented in the following pages.

1. POPULATION

Three different bands comprise the Ute Indian population of the Uintah and Ouray Reservation. These bands include the Uintah, Uncompahgre, and Whiteriver Bands. Residing on the Reservation are 1,271 enrolled Ute tribal members, while another 340 live off the Reservation. In addition, approximately 400 unenrolled mixed-blood Indians live in the general region. Total population, Indian and non-Indian, living in the Uintah Basin, is about 20,000.

2. INDIAN LABOR FORCE

Total available Indian labor force, age 16 years and over, is:

	<u>Male</u>	<u>Female</u>	<u>Total</u>
Permanently Employed	95	9	104
Temporarily Employed	11	2	13
Unemployed	<u>179</u>	<u>162</u>	<u>341</u>
 TOTAL LABOR FORCE	285	173	458
 POPULATION	634	626	1,260

Nearly 85-percent of all employable male Ute Indians on the Reservation live in five communities. By count, they are Ouray, 16; Randlett, 61; Fort Duchesne, 51; Myton, 25; and Whiterock, 88. The remaining males reside in rural areas on the Reservation.

3. INDUSTRIAL PARKS

No industrial park presently exists on the Reservation. The Ute Tribal Business Committee has endeavored to find one definite industrial enterprise of sufficient size to locate there before development of such a park. There is a possibility that the park could be designed to include certain features specifically designed for such an industrial enterprise. In any event, the park would include a prepared site, access roads, utilities, sewage system, and possibly industrial waste disposal.

4. PLANNED DEVELOPMENTS

Construction of the multimillion-dollar Bottle Hollow Recreation Center is scheduled to begin early this year. The project, funded jointly by federal agencies and the Ute Tribe, will include a \$1 million dam-reservoir system and a \$1.4 million recreation complex that will include a motel, tourist cabins, and shops overlooking the reservoir. Construction of the complex by a private contractor will take about a year for completion.

Tentative approval also has been given to the Ute Indians by the State of Utah for tribal participation in the Land and Water Conservation Fund, which provides matching monies for campground development around certain popular and well-used lakes and reservoirs.

5. TRIBAL INVESTMENTS

Tribal monies are divided among several educational, operational, reserve, dividend, and investment funds. Some of the money is in the federal treasury, but most is banked with private financial institutions. The substantial investment funds is to be used for investment in industrial development. The extent of tribal financial participation in any projected enterprise thus depends on negotiations between the Tribal Business Committee and any proposed company. In the past, any proposal made to the tribe involving the tribe's minimum participation, according to the requirements of the Economic Development Administration has been met or exceeded. Tribal investment in industry has been an important consideration.

6. EXISTING ENTERPRISES

The Uintah Basin is oriented agriculturally with emphasis on cattle raising. Producing oil and gas wells, although concentrated in the eastern part of the Basin, also are found throughout. Considerable oil exploration is going on in the northern part of the Reservation. Several sawmills are in the area. Saw lumber is produced from the Reservation and from the adjacent Ashley National Forest.

The Ute livestock enterprise is the most significant present tribal business enterprise and has nearly reached its base herd size of 5,300. The 5,000 to 6,000 head marketed yearly bring high prices due to their high quality and the modern raising techniques, such as prefinishing used. Additionally, a Ute custom-hunting enterprise, Nu TuVeep, brings a high fee from sportsmen who are flown into an isolated hunting camp deep in the wilderness section of the Reservation.

7. BUSINESS ESTABLISHMENTS

The usual small-town shopping facilities available in Roosevelt include nationwide chain stores. All major automobile agencies, with their repair shops, also are represented. Nearby, Vernal, being a larger town, has more and varied shopping facilities. There is one bank in each of the two towns with national affiliations, and a local bank in Vernal.

Permanent rental housing units are available in both towns. Vernal has 256 hotel and 566 motel units. About 170 and 188 units, respectively, are available in Roosevelt.

The Uintah Basin is served by a full-time radio station located in

Vernal. Additionally, three television stations representing the NBC, CBS, and ABC networks are received there.

8. EDUCATIONAL

The normal range of grade schools and high schools are located on or adjacent to the Reservation. A new vocational school near Roosevelt Union High was completed and opened in September 1968. A resident extension division of Utah State University for Uintah Basin is headquartered in Roosevelt. It offers undergraduate, graduate, and special training courses upon demand.

A branch of the Utah State Extension Service, located in Fort Duchesne, offers assistance and training in agriculture, animal husbandry, and home economics.

9. MEDICAL FACILITIES

The U. S. Public Health Service, Division of Indian Health, operates an Indian Health Clinic at Fort Duchesne. In addition, hospital care, as well as medical, dental, optometry, and surgical care, are provided by contract facilities in Roosevelt and Salt Lake City. A new hospital in Roosevelt will be completed in 1969, which will contain an Indian wing and the Indian Health Clinic.

Located in Vernal, the modern and well equipped Uintah County Hospital has 30 beds with space and facilities available for enlargement to 42 beds. It is fully-staffed with doctors, registered nurses, a laboratory technician, and other required personnel. A privately-owned ambulance provides 24-hour service in the area.

10. LAW ENFORCEMENT

A tribal court and a police force is maintained on the Reservation, with jurisdiction over Ute Indians only. These are assisted by a federal law and order officer employed by the Bureau of Indian Affairs.

Non-Indians are subject only to county and state laws. Indians also are answerable to civil authority for civil offenses and law violations.

11. RECREATIONAL OPPORTUNITIES

Outdoor recreation is dominant in the Uintah Basin where hunting and fishing facilities are virtually unsurpassed. Such game as elk, deer, antelope,

mountain lion, bear, coyote, bobcat, chukkar, and pheasant are relatively abundant. Wild turkeys have been planted, and planting of mountain sheep also is being considered. Moose are found in the adjoining Ashley National Forest. Trout fishing is excellent in the miles of streams and rivers and in the lakes and reservoirs on and adjacent to the Reservation. The Bottle Hollow recreational complex will be ready for use by 1970.

Just north of the Reservation within the Ashley National Forest, the High Uintah wilderness area has been set aside for those who enjoy a forested and mountainous region unchanged by man. The thousands of lakes located in this wilderness are dominated by 13,490-foot King's Peak, Utah's highest.

Other types of recreational activities include horseback riding, bowling, tennis, baseball, football, basketball activities, and golfing in Vernal. Concerts by the Utah Symphony and other cultural groups are offered occasionally in Roosevelt and Vernal. A national museum of natural history emphasizing the prehistoric life that abounded once near the area a few miles to the northeast is known as Dinosaur National Monument. Directly north of Vernal is the famous Flaming Gorge National Recreation Area. Roosevelt and Vernal have most of the usual service and fraternal clubs.

Religious dances of the Ute Indians attract many visitors each year. Though dates change from year to year, Bear Dances are held in the spring (March or April) and Sun Dances in the summer (July or August).

12. TRANSPORTATION

A railroad does not operate in the Uintah Basin. Nearest railheads are the Denver & Rio Grande at Castle Gate, about 42 miles south of Duchesne; the Union Pacific, 80 miles west of Duchesne; and the D&RG at Craig, Colorado, 131 miles east of Vernal. A feasibility study of building a railroad in the Basin is being conducted by the University of Utah.

Trucking is the lifeline of the Uintah Basin. At least six lines serve the area. They are Link Trucking, Uintah Freightways, W. S. Hatch Company, Pacific Intermountain Express, Nebeker's Trucking, and Bob Jones Trucking Company. More freight continually comes into the Basin than goes out; hence, back-hauling is eagerly sought. U. S. Highway 40 is the main route between Denver and California.

Continental Trailways provides passenger bus service and has stops at Roosevelt and at a point one mile north of Fort Duchesne. Scheduled commercial air service via Frontier Airlines is available at Vernal, 23 miles east of Fort Duchesne. Roosevelt has a municipal airport, but it has no commercial flights.

13. WATER SUPPLY

The following five towns on the Ute Reservation have the indicated available industrial water supply.

	<u>Acre Ft./Yr.</u>	<u>Billion Gallon/Year</u>
Ouray	172,669	56.26
Duchesne	10,010	3.26
Myton	26,364	8.59
Fort Duchesne	6,000	1.95
Randlett	6,000	1.95

This supply could be pumped directly from the streams. Canal or ditch delivery would be practically impossible during the winter months.

A domestic water system was installed by the Ute Tribe in 1965. This system supplies water to most of the Indian and non-Indian towns in the central part of the Uintah Basin and is continually being improved and extended.

14. WASTE DISPOSAL PROBLEMS

Ample tribally-owned land for use in waste disposal is available at all proposed industrial sites within the Reservation. Thus, interested industrial firms needing land for waste disposal should consult with the Tribal Business Committee before the Tribe makes application for an industrial park. Depending upon circumstances and negotiations, the Ute Tribe would consider constructing certain waste disposal facilities if these are not considered part of a proposed industrial park.

15. ELECTRICITY

Electrical service is furnished by the Uintah Power and Light Company in accordance with: Electric Service, State of Utah, Schedule No. 3, General Service. The service will be available at any point on the Company's system having facilities of adequate capacity. This schedule calls for alternating current, single or three-phase electric service supplied at company's available voltage through one kilowatt-hour meter at a single point of delivery for all service required on the premises.

Monthly cost of the service, per kilowatt hour, currently is:

Rate:

\$4.30 per kwh for first 500 kwh*
\$3.10 per kwh for next 500 kwh
\$1.90 per kwh for next 5,000 kwh
\$1.20 per kwh for next 10,000 kwh
\$1.00 per kwh all additional kwh

*add 70 kwh for each kw of demand in excess of 5.

Voltage Discount:

The following voltage discount based on measured demand will apply where a customer takes service of 2,300 volts or higher from the company's available lines and provides and maintains all transformers and other necessary equipment.

20¢ per kw for first 100 kw of demand
10¢ per kw for all additional kw of demand

Net Minimum:

A charge of \$1.10 plus \$1.10 for each kw of demand over 5 kw will be levied but not less than \$3.30 for three-phase service.

Demand to the nearest kw is determined by the company's demand meter for the 15-minute period of the customer's greatest use during the month.

Negotiations for rates lower than the 1¢ per kwh are possible for industries that use very large amounts. Such negotiations involve the board of directors of the Uintah Power and Light Company and the Utah Public Service Commission.

16. NATURAL GAS SUPPLY

Mountain Fuel Supply Company furnishes natural gas to the western and central parts of the Uintah Basin, while Utah Gas Service Company supplies the eastern section.

The towns of Ouray, Fort Duchesne, and Randlett are not presently supplied with natural gas. A natural gas line does run very close to Ouray, and gas would be made available upon demand by an industry. Surveying has been completed for bringing a gas line to Fort Duchesne from nearby

Roosevelt. This line will serve (1) the community of Fort Duchesne, (2) the tribal and federal government offices here, and (3) the new Bottle Hollow recreational complex close by.

Natural gas utilization in the Mountain Fuel Supply Company service area follows the generally-accepted standards and procedures of the gas suppliers elsewhere for similar conditions.

The gas supplier's low pressure distribution system is operated at an average of seven inches of water gauge pressure. The company's intermediate pressure distribution system is operated at from 15 to 30 pounds of gauge pressure. For all domestic or commercial appliances, this pressure is reduced to approximately seven inches of water gauge pressure at the point of entrance to a building or dwelling. Industrial consumers are invited to consult with the company regarding pressures available for industrial application of gas.

B. NATURAL RESOURCES FOR POTENTIAL DEVELOPMENT

Natural resources on and adjacent to the Uintah and Ouray Reservation consist basically of crude oil, natural gas, gilsonite, bituminous sandstone, oil shale, coal, phosphate, metallic minerals, nonmetallic minerals, timber, and water.

Knowledge of actual number, extent, quality, and quantity of natural resource deposits is inadequate since an in-depth geologic survey has not been made on the Reservation or on federal lands adjacent to it.

1. CRUDE OIL

Approximately 200 oil wells in eastern Utah produce an estimated 20,000 barrels a day. An active oil exploration effort has resulted in development of several new wells adjacent to the reservation, one producing approximately 350 barrels a day; two other wells produce a total of over 2,400 barrels a day. Drilling and exploration efforts are increasing because of these developments.

No refining facilities exist in the Uintah Basin. A crude oil transfer pipeline from the Uintah Basin to the Salt Lake City refineries consists of two 10-inch lines through the Myton area. A new line to Myton soon will connect the Neola production area.

2. NATURAL GAS

Natural gas is a major natural resource in the Uintah Basin; reserves there are estimated in excess of 2 trillion cubic feet. This fuel is collected and transmitted to the Mountain Fuel Supply Company's system by a 20-inch main line to the Wasatch Front. A Pacific Northwest Pipeline Company line from the Four-Corners Area of the Southwestern United States carrying natural gas to the Pacific Northwest passes east of Vernal through the Ashley Field. Each of the newly developed oil wells in the Neola area of the Uintah Basin can produce 5 to 6 million cubic feet of natural gas.

3. GILSONITE

Gilsonite, a unique solid petroleum substance occurring in pure form in large veins in the Uintah Basin, already supports a multi-million

dollar mining industry there. Estimates of reserves run as high as 30 million tons, worth approximately \$1.3 billion. The veins, many exposed at the earth's surface, are from 2 to 20 feet wide and from 100 to 1,500 feet deep.

Gilsonite is a predominantly aromatic asphaltite type substance that fuses relatively easily and burns like tar. It is brittle and has a distinctive conchoidal to hackly fracture. When fresh Gilsonite has a brilliant black luster; but weathered, it and some of its more refractory varieties have a dull, soot-black color. Gilsonite has a specific gravity of 1.07, is soluble in asphalt-based petroleum, and frequently is employed to change the consistency of lighter petroleum products. It is a bitumen and has approximately the composition of an asphalt-based petroleum, but with most of the volatile constituents missing.

When heated to 250° F or higher (up to 500° F for the more refractory varieties), Gilsonite melts and liberates some volatile constituents. It can be heat refined to produce high octane gasoline, motor oil, and other petroleum products, and it leaves a residue of pure carbon coke of high market value.

4. BITUMINOUS SANDSTONE

Bituminous sandstones occur in many locations of the Uintah Basin, the most prominent being at Asphalt Ridge, west and southwest of Vernal. An estimated 1.175 billion cubic yards of this material exist in an 11.5 by 1.5 mile track back from this outcrop and containing as much as 2 billion barrels of bitumen (paraffin-base oil). These bituminous beds range from a few feet to over 190 feet thick along the east flank of Asphalt Ridge. Bituminous sandstone deposits exist within and adjacent to the Reservation in an area west of Whiterocks and also in Yellowstone Canyon.

Legislation in late 1960 opened bituminous sandstone and Gilsonite deposits on federal lands to public leasing. Previously for approximately fifty years, these lands were withheld from all forms of exploration, although many valuable deposits were known to exist there. Leasing on Federal lands is very difficult; thus, the reserves in these areas are still undeveloped.

5. OIL SHALE

The oil potential of the Uintah Basin from oil shale has been estimated roughly at 1.3 billion barrels. Rich oil shale is a dark brown, fairly dense, fine grained laminated rock that is resistant to weathering and forms conspicuous blue-gray ledges in the softer enclosing sediments.

Oil shale is a marlstone composed principally of inorganic matter (50 to 75%), dolomite and calcite; clay materials (up to 21%); and analcite (1 to 16%). Organic matter in oil shale ranges from 0 to 50%, yielding up to 87 gallons of oil per ton of rock.

When oil shale is heated to 400° F or above in a closed system, part of the organic material passes off in a gaseous form and can be condensed and recovered as liquid petroleum, or shale oil. This petroleum has a specific gravity of from 0.859 to 0.9327. It is a black, highly viscous, waxy crude oil, which at room temperature is a soft slushy solid. Its pour point is 90° F; thus, transportation by pipeline of the raw shale oil is not practical. When properly refined, the finished derived product is indistinguishable from its natural petroleum counterparts.

The Naval Oil Shale Reserve and other high potential deposits are on or immediately adjacent to the Uintah and Ouray Reservation. The Naval Oil Shale Reserve was established by Presidential Order of December 6, 1916. This reserve consists of 132 square miles in Townships 12 and 13 South, Ranges 18 and 19, East. Exposures of the oil shale border the canyon of the Green River and tributary canyons, but most of the rich oil shale beds are covered by overburden.

Prior to the Mineral Leasing Act of February 25, 1920, oil shale could be acquired by placer mining location, and thousands of acres of valuable oil shale lands were claimed under the mining laws. Many of these claims in the Dragon-Watson area were subsequently patented; hence, many of the better surface deposits of oil shale in Utah today are on privately owned land.

After 1920, oil shale could no longer be acquired by mining claim, but mining leases were available on a rental-royalty basis through the U.S. General Land Office. Owners of oil shale mining claims were granted a preference provided they relinquished their claims to the government. However, by Executive Order of April 19, 1930, all oil shale lands owned by the United States, including outstanding unperfected mining claims, were withdrawn "temporarily" from all forms of disposal, except patent under the mining laws. The withdrawal effectively barred any private acquisition or development of federally owned oil shale lands in Utah, Colorado, and Wyoming.

The Bureau of Mines has operated an oil shale pilot plant at Rifle, Colorado, exploring feasible extraction techniques. A private firm is planning to build a commercial production plant at Parachute Creek, 160 miles west of Denver. Primary reason for the increasing interest in extraction of oil from oil shale is that present U.S. oil reserves will last only into the 1980's at the present depletion rate. The federal government is analyzing different alternatives to development of the reserves under federal lands and considering the various existing extraction

processes: surface retort, in-situ retort, water pressurization, chemical explosives, and high voltage electricity. Indications are the federal government feels the best way to develop this resource is by government-industry coordinated efforts.

6. COAL

The combined coal resources of the Uintah Basin, while not great in comparison with the larger coal fields elsewhere in Utah and Colorado, still are significant from the standpoint of local markets and future industry. An estimated 44 million tons of coal are available in the Basin's Deep Creek district alone. At present, coal mines in the Uintah Basin are idle; however, interest seems to be picking up and possible future coking techniques will utilize the coal resources.

7. PHOSPHATE

Phosphatic rock is exposed along the south flank of the eastern Uintah Mountains at about 7,000 to 8,000 feet elevation. West of the Whiterocks River, the Park City Formation is buried beneath the tertiary sediments for a distance of more than 25 miles. The deposits east of this area presently are being mined by the Stauffer Chemical Company at Brush Creek. This plant presently is closed because of nonavailability of sulfuric acid and other economic problems. An estimated 2 billion tons of phosphate rock still exist in the Uintah Basin with just this one mining operation in progress.

8. METALLIC MINERALS

Deposits containing commercially valuable metallic minerals such as copper, lead, zinc, silver, iron, manganese, gold, molybdenum, and uranium are relatively scarce in the Uintah Basin. Of the few known deposits there, most are merely in the prospecting stage and the remaining deposits, such as molybdenum and fossil-replacing copper near Ouray, are scientific curiosities in addition to having past or potential value.

9. NONMETALLIC MINERALS

Several indications of possible deposits of valuable nonmetallic minerals or rock such as aeolites, gypsum, salt, bentonite, trona, sand and gravel, flagstone, and others now lack significance; but with continued

industrial development of the Unitah Basin these may have added meaning.

10. TIMBER

Commercial forests of 30,000 acres of timber on the Reservation contain approximately 54 million board feet. The saw timber consists of ponderosa pine, lodgepole pine, Douglas fir, alpine fir, and Engleman spruce. In addition to this timber, which is being utilized, prime resources of pinon pine and juniper wood suitable for firewood and charcoal are available over large areas of the Reservation.

Ground surveys made in 1968 by BIA personnel in the Hill Creek extension of the Reservation projected 420,000 tons of dry and 586,000 tons of green wood. Additional areas near Whiterocks, John Starr Flat, and on adjacent Bureau of Land Management (BLM) lands were surveyed with indication of potential support there for charcoal and firewood industries. Positive additional benefits can be derived from the clearing of pinon pine and juniper from potentially excellent cattle range.

C. UREA MARKET RESEARCH

Original request for technical assistance to establish a urea fertilizer plant was based on data developed prior to February 1967. Since then many significant changes have taken place in the world, national, and local fertilizer industries. Current and projected market outlook for urea fertilizer has been analyzed as follows.

1. WORLD MARKET

Fertilizer production throughout the world increased rapidly from 1960 through 1967. In the United States and Western Europe production increased 50 percent between 1963 and 1965.

Major producers looked for a very rapid increase in the use of fertilizer in underdeveloped countries. Export markets have not developed as they expected; primarily, as a result of the following three factors.

1. A serious shortage of foreign exchange exists.
2. Overall level of agricultural technology in underdeveloped countries must be raised prior to utilization of large quantities of commercial fertilizers.
3. The State Department's Agency for International Development (USAID) has delivered only a fraction of originally forecast quantities of fertilizer to underdeveloped countries. Forecast for 1967 was for \$450 million; actual deliveries were approximately \$140 million, or 31 percent of the estimate.

A recent study made by the Tennessee Valley Authority for the USAID agency indicates that there will be an excess of production capacity over consumption through 1972, as indicated in Table I.

TABLE I
RATIO OF POTENTIAL WORLDWIDE
FERTILIZER PRODUCTION-CONSUMPTION

	<u>Consumed</u>		<u>Projected</u>	
	<u>1965</u>	<u>1967</u>	<u>1970</u>	<u>1972</u>
<u>World Summary</u>				
Developed	1.18	1.22	1.25	1.19
Developing	0.64	0.53	0.66	0.59
World	1.10	1.10	1.14	1.07

	Consumed		Projected	
	1965	1967	1970	1972
<u>Developed Regions</u>				
North America	1.25	1.37	1.50	1.28
Western Europe	1.24	1.26	1.24	1.22
Eastern Europe	1.10	1.04	1.07	1.12
Oceania, Japan	0.93	1.10	1.13	1.10
<u>Developing Regions</u>				
Asia, less Japan	0.59	0.46	0.56	0.48
Africa	0.80	0.77	1.38	1.30
Latin America	0.67	0.57	0.64	0.65

The world fertilizer market reflects a satisfactory long range growth potential. However, this potential is less attractive to fertilizer producers because of current serious problems of over-production and depressed prices.

2. NATIONAL MARKET

The fertilizer market in the United States in 1968 is characterized by over-capacity, large inventories, low prices, and reduced profits. Prices of all major fertilizer products declined significantly; ammonia prices in Arizona declined 27 percent during 1967. Price of urea delivered in the Intermountain Area declined from approximately \$100 per ton to \$71 per ton for bulk shipments. Anhydrous ammonia in the Midwest dropped from \$100 per ton to \$65 per ton, while other fertilizer products registered similar reductions in price.

Prices dropped because of the over-capacity that resulted from enthusiasm of many large companies over the growth potential of the fertilizer industry during the early 1960's. These companies rapidly expanded production of the three basic fertilizer ingredients: nitrogen, potash, and phosphate. In the five years preceding 1967, United States fertilizer companies invested \$4 billion for new mines, plants, transportation, and distribution systems, resulting in a very large increase in the capacity of the industry. Since 1963 the capacity of phosphate rock mines was increased from 20 million tons per year to 39 million tons per year; an increase of 95 percent. Ammonia capacity increased from 3.5 million tons per year to 9.6 million tons per year: an increase of 170 percent. Production of potash in the United States has not kept pace with ammonia; however, Canadian production has increased to more than make up any apparent shortages in the United States.

In the 1950's, United States fertilizer usage was growing at a rate of about 6 percent per year. Because of pressure to solve the world food problem, many people assumed the rate of consumption would increase at a much greater rate, and plant expansion plans were based on a high anticipated growth figure. Actual growth rate of fertilizer consumption in the United States averaged around 7 to 8 percent per year during 1965 through 1967.

Other factors also combined to complicate the fertilizer situation during 1967 and 1968. Application of fertilizer was reduced due to wet spring seasons. Inventory at the end of the fertilizer season amounts to about 12 months production, worth approximately \$2 billion at retail price.

Companies have made large capital investments in plants designed to operate efficiently at high production levels. To maintain efficient production, they continue producing at high rates even though the resulting large inventories have lowered market prices. In March of 1968, anhydrous ammonia was selling as low as \$45 a ton, while the published price was \$60 per ton. Diammonium phosphate was discounted to \$75 per ton, though the published price was \$95 per ton.

The problem has been intensified by technological improvements, resulting in substantial economies of production, particularly for ammonia. New production techniques make it possible to cut the cost of producing ammonia from \$40 per ton to \$20 per ton; major fertilizer producers are purchasing \$400 million worth of more efficient ammonia production facilities. Location is a factor because it costs approximately \$20 per ton, for example, to transport ammonia from the Texas Gulf area to Central Iowa. Producers feel that a pipeline presently under construction will reduce this cost of transportation to approximately \$8 per ton. Less efficient plants in these market areas will be forced to lower prices after completion of this pipeline.

The Government's farm subsidy policy further complicates the situation by taking out of production 10 million acres of agricultural land, mostly in the Midwest.

Fertilizer manufacturers are being forced to integrate vertically and develop wholesale and retail distribution systems, while closing down their less efficient plants. The Central Farmers Cooperative, organized in 1946 for the purpose of providing fertilizer to the farmers at the lowest possible price, distributes to 21 regional cooperatives having 7,500 sales outlets in 43 states and in Canada. In 1967 the organization sold \$550 million worth of fertilizer (28 percent of the national U.S. retail market). Concerned that the fertilizer companies would begin to enter the retail market themselves, Central Farmers Cooperative began to integrate back into fertilizer materials production and now produces basic fertilizer ingredients, having an investment in an ammonia plant in Louisiana, a phosphate facility in Florida, and potash and urea plants in Canada. This type of vertical integration further denies the growth of less competitive producers.

Price competition, due to like appearance of products is the primary competitive factor and has resulted in competitive pricing and discounting, with rebates, similar to the gasoline price wars of a few years ago. The fertilizer industry in the United States apparently has excess capacity that will last through 1972 and it may be a decade until fertilizer consumption and production come back into reasonable balance. Inevitably only the large, well-financed, vertically integrated companies will survive and the smaller,

weaker companies will either go out of business or will merge with larger concerns.

3. INTERMOUNTAIN MARKET

The Intermountain states fertilizer market is not significantly different than the national market. During the 1960's, the local fertilizer production increased greatly with the development of new phosphate mines and processing plants, and local application has not developed as it has in the Midwest and Pacific Coast States for the following two primary reasons.

1. Much of the region is dry farmed and it is not possible to use significant quantities of commercial fertilizer due to lack of moisture.
2. Farms in the Intermountain Area are generally smaller and less easily adapted to application of modern fertilizing techniques.

Over production and slow growth of the Intermountain fertilizer market has resulted in closing of large and expensive local production plants. Stauffer closed its phosphate operation in the Uintah Basin and Monsanto and El Paso Natural Gas closed their phosphate facilities in Soda Springs, Idaho. El Paso Natural Gas built its new \$40 million phosphatic fertilizer plant at Soda Springs, Idaho, having an advance agreement with a local cooperative for 50 percent of the plant's output. The marketing plan was to cut prices to sell the other 50 percent, but the competitor had a more efficient operation, a better distribution system, and was able to meet every price cut until El Paso closed the plant to stop its loss.

Total consumption of all commercial fertilizers in the Intermountain area is shown in Table II, consumption by type is shown in Table III, and consumption of urea fertilizers is shown in Table IV.

TABLE II
TOTAL INTERMOUNTAIN FERTILIZER CONSUMPTION

	1965 (Tons)	1966 (Tons)	1967 (Tons)
Montana	75,082	102,358	141,160
Idaho	254,109	288,140	305,250
Wyoming	30,970	32,252	50,287
Colorado	187,981	189,508	226,226
New Mexico	66,459	67,052	73,722
Arizona	234,741	233,863	241,853
Utah	60,043	58,842	76,210
Nevada	13,146	11,794	14,767
TOTAL	922,531	983,809	1,129,475

TABLE III
TOTAL INTERMOUNTAIN FERTILIZER
CONSUMPTION BY TYPE

(Year Ending 30 June 1967)

<u>Type</u>	<u>Tons</u>
Mixtures	262,355
Nitrogen Material	505,355
Natural Organic Material	18,050
Phosphate Material	293,977
Potash Materials	15,835
Secondary and Micronutrient Material	33,903
	<u>1,129,475</u>

TABLE IV
CONSUMPTION OF UREA FERTILIZERS
IN THE INTERMOUNTAIN AREA

(1965 through 1967)

	<u>1965</u> <u>(Tons)</u>	<u>1966</u> <u>(Tons)</u>	<u>1967</u> <u>(Tons)</u>
Montana	232	201	352
Idaho	8,635	6,904	10,421
Wyoming	44	182	214
Colorado	5,017	4,974	4,017
New Mexico	5,160	4,799	3,637
Arizona	25,902	24,721	25,697
Utah	1,695	1,403	808
Nevada	217	180	420
<u>TOTAL</u>	<u>46,902</u>	<u>43,364</u>	<u>45,566</u>

In the State of Utah urea sales were only 4 percent of the total fertilizer used and only 9 percent of nitrogen materials, averaging only 1,300 tons per year for the past three years. Close analysis of the market in adjacent states is necessary because of transportation limitations and the fact that other producers are in the area. Urea plants now are located at Cheyenne, Wyoming; Kennewick, Washington; and Hercules, San Francisco, Los Angeles and El Centro, California. The market that a Utah plant might service probably would be restricted to parts of adjacent states where a freight advantage exists.

Future use of urea for fertilizer and animal feed is projected in Table V. These projections are based on an assumed 10 percent per year rate of increase.

TABLE V
FORECAST CONSUMPTION OF UREA IN THE
INTERMOUNTAIN STATES

(Fertilizer and Animal Feed)
(1968 - 1976)

<u>Year</u>	<u>Fertilizer (Tons)</u>	<u>Animal Feed (Tons)</u>	<u>Total (Tons)</u>
1968	17,780	24,200	41,980
1969	19,558	26,620	46,178
1970	21,514	29,282	50,796
1971	23,665	32,210	55,875
1972	26,031	35,413	61,444
1973	38,634	38,974	77,608
1975	34,647	47,159	81,806
1976	38,112	51,874	89,986

The latest available statistics indicate that total United States consumption of urea for cattle and sheep feed was approximately 165,000 tons per year. The Economic Research Service of the Department of Agriculture estimated the portion utilized in the Mountain States to be 26,400 tons. Industrial uses of urea in this region are relatively limited and can be considered negligible for the purpose of forecasting consumption. National consumption data for all uses are not available, but the trend for urea use as fertilizer was:

1965	427,555 tons
1966	467,359 tons
1967	503,483 tons

The major factors influencing the use of urea as a fertilizer in the Intermountain Area are:

1. Substantial production of phosphatic fertilizer exists and specialists from universities and industries, being familiar with its use and its ease of application, recommend it to the farmer. Manufacturers have well developed and well established distribution and bulk application systems.

2. Urea is hygroscopic, making it hard to store and handle in bulk and is even more difficult to use in the presence of other fertilizer materials.
3. Farmers have not been educated to the use of urea fertilizers to the degree that they have been trained to use other fertilizers.

The following factors have slowed the rate of increase in the use of urea as animal feed.

1. Most animal feeders in the Intermountain Area utilize substantial quantities of high protein content alfalfa hay; hence, protein supplements are not required.
2. The price of urea has been high compared with such other high protein supplements as cotton seed meal and soybean meal.
3. Many farmers have not been educated in the use of urea and some are reluctant to use it because it may be toxic.
4. Not many large feed lots or feed plants exist in the area and those that do have only recently started to use urea to the maximum recommended level.

Table V also shows a forecast of the total urea consumption in the six Intermountain States. When the total is compared to the projected plant output of 66,000 tons per year, it becomes evident that a plant located in Utah would have difficulty developing a market large enough to operate at an economic level. Such a plant would have to capture essentially 100 percent of the market in the area. Such a high capture percentage is not possible because:

1. Many of the fertilizer producers are integrated vertically and, therefore, would distribute their own product even if costs were somewhat higher.
2. Certain portions of the six state area can be more economically supplied from plants located in California, Washington, and Wyoming.
3. A Utah plant, if located on or near the Ute Reservation, would not have direct access to a railroad and therefore would be faced with extra handling and transportation charges.

D. LUMP CHARCOAL AND CHARCOAL BRIQUETS

During study of Uintah and Ouray Reservation natural resources, the Thiokol-Ute-BIA study team learned that large reserves of pinon pine and juniper woods exist there. The Reservation's BIA forester revealed that the area has approximately 450,000 acres of pinon pine and juniper trees, a large percentage of this resource with the potential for processing into charcoal, both lump and briquet.

During field timber density surveys of the southern extension of the Reservation, the forester and BIA program officer determined that 100,000 acres has an average of at least 4.2 tons of dried pinon pine per acre and 5.8 tons of green pinon pine and juniper per acre. Other areas of the Reservation are equally abundant in this resource.

Thiokol desired a professional opinion from an established charcoal producer and marketer to consider its research of the quality of Reservation pinon pine charcoal. One of the firms presently marketing charcoal products in the Intermountain Area, Keeter Charcoal Company of Branson, Missouri, indicated an initial interest in the possibility of charcoal being produced and briquetted on the Reservation. The initial concern was the quality of charcoal produced from pinon pine. A load of 10 cords of pinon pine was shipped to the Keeter Crickett, Arkansas, kilns where it was charred, then briquetted in the Branson, Missouri, plant. Chemical, physical, and general overall quality analyses were performed. Results of the evaluation and analysis of these tests made on the charcoaling of pinon pine are included in this study.

1. LITERATURE RESEARCH

A literature survey revealed that substantial research had been completed previously on all aspects of pinon pine and juniper cord wood and their harvest. Section VII, Bibliography, includes a summary of the literature reviewed. The most significant studies concerning ways to utilize these currently non-commercial forests had been made by the Bureau of Land Management (BLM) and Utah State University (USU). These studies, conducted from 1963 to 1966, and not yet published, include detailed up-to-date information. Major objectives of these studies were:

1. To determine harvesting costs of pinon pine and juniper cord wood.
2. To determine cost of producing charcoal from pinon pine and juniper wood.
3. To determine chemical and physical properties of charcoal produced from pinon pine and juniper wood.
4. To determine demand for bulk charcoal and charcoal briquets in the Western States.
5. To analyze the Western States charcoal industry.
6. To investigate potential of pinon pine as a fireplace fuel.

Utilizing the BLM - USU documents, Forest Service publications, and up-dated market research information, the following key facts were determined by the study.

Charcoal consumption has increased rapidly in the Western United States since 1945, with an average growth rate of 5 percent per year.

The majority of charcoal briquets are produced in the Eastern United States and shipped throughout the entire country. Charcoal briquets produced in California, Oregon, and North Dakota primarily supply the Intermountain and West Coast markets; however, large quantities of charcoal briquets are shipped into these markets from Eastern producers. Wholesale prices in the 1968 Salt Lake City market for ten pound bags varied from \$88 per ton to \$118 per ton. Prices were slightly higher on the West Coast. Harvesting of cordwood must be conducted very efficiently due to the high degree of competition presently existing from firms using low-cost wood waste, peach pits, walnut hulls, and lignite feed stocks in highly automated carbonizing retort furnaces. Such low cost raw materials place harvested charcoal briquet operations in a possible economic disadvantage unless highly efficient harvesting techniques are used.

Lump charcoal produced in Mexico from mesquite is bulk-shipped to Arizona where it is packaged in 40 pound bags and sold on the local market. It also is shipped to the substantial 10,000-ton-per-year California markets. The present source of supply from Mexico reportedly is unreliable so the possibility of penetrating that market exists to some extent. However, to operate a lump charcoal industry profitably on the Uintah and Ouray Reservation would require reliable delivery in bulk to California markets at a price equal to or lower than Mexico's \$60 per ton. Mexico's low cost waste utilization and more efficient and established production methods realistically appear to be distinct competitive advantages.

The following employment levels could be projected for efficient lump charcoal and charcoal briquet operation on the Uintah and Ouray Reservation.

1. Potential for a 5,000 ton/year lump charcoal industry - 40 manyears/year;
2. Potential for a 5,000 ton/year charcoal briquet industry - 50 manyears/year.

Proportionate employment levels could be projected for combinations of different levels of production in these industries. Profits would increase considerably with proportionately higher wage levels. Greater utilization of labor-saving harvesting and processing equipment would tend to eliminate some of the hand labor.

Capital investment required for facilities and equipment for these industries would be approximately \$9,000 to \$12,000 per income producing job; a very favorable investment figure. For example, the chemical industry estimates a minimum investment of \$100,000 per job, and this figure sometimes reaches \$200,000 per job.

2. STUDY CRITERIA

Criteria used in this analysis of marketing the Reservation's abundant supply of pinon pine wood as charcoal, both in lump and briquet forms, are described in this subsection. These criteria were derived from the extensive literature research and personal investigations completed by the Thiokol-BIA-Ute study team.

3. CHARCOAL FROM PINON PINE

Pinon pine, a very dense softwood, actually compares favorably with the light hardwoods. In analysis of yield calculations, conducted by Keeter Charcoal Company, a weight of 3,000 pounds per cord was

used as the weight of wood loaded into kilns. The ten measured cords of the pinon pine burned yielded 6,100 pounds of raw charcoal, requiring 3.3 cords of wood to make one ton of charcoal.

Estimated manhours/cord for harvesting pinon pine:

<u>Operation</u>	<u>Estimate (manhours)</u>
Felling, limbing, and bucking	4.00
Slash disposal	0.80
Loading, hauling to kilns, and unloading	1.30
Splitting and piling (only oversize cordwood)	<u>0.10</u>
Subtotal	6.20
Labor costs @ \$1.70/hour (average)	\$10.54/cord

Estimated costs of materials, supplies, maintenance, and depreciation per cord:

<u>Item</u>	<u>Estimate (\$/cord)</u>
Power saws	0.50
Wood truck	0.50
Power splitter	0.10
Other (axes, tools, records, etc.)	<u>0.20</u>
Subtotal	1.30

Employee benefits, insurance, and contingencies per cord:

<u>Item</u>	<u>Estimate (\$/cord)</u>
Workmen's compensation and employer's liability	0.35
Insurance and fees	0.30
Employee benefits	0.20
Contingencies (weather, stoppages, abnormal repairs)	<u>0.40</u>
Subtotal	1.25

Total harvesting costs per cord:

<u>Item</u>	<u>Estimate (\$/cord)</u>
Harvesting operations	10.54
Materials, supplies, etc.	1.30
Benefits, insurance, and contingencies	<u>1.25</u>
Total	13.09

Stumpage and road maintenance costs are not included. Not considered also are possible range improvement values (up to \$10 per acre in potentially productive range areas) which could be assumed a valid factor where the cleared land can be transformed into good grazing land by cultivation and seeding of range grasses. This credit possibly could be gained under contract by those conducting the wood harvesting operations.

Estimates of equipment costs assume acquisition of all new equipment. If surplus equipment can be obtained from the government, considerable savings can be realized. Also, it is assumed that harvesting crews will commute daily from their homes to the harvesting areas. If not, it will be necessary to establish forest area camp living for them. Approximately \$20,000 additional funds will be required to establish adequate facilities.

A 20 percent charcoal yield factor from pinon pine wood has been used to estimate costs. Based on this 20 percent factor, 3.3 cords at 3,000 pounds per cord, or 4.95 tons, of cordwood will be required in the kiln for each ton of charcoal produced.

Total harvesting costs per ton of charcoal produced are:

3.3 cords of wood/ton at \$13.09/cord of wood = \$43.20/ton.

4. LUMP CHARCOAL ANALYSIS

a. Market Analysis--Considerable data compiled by Utah State University for the Bureau of Land Management and the State of Utah has been studied to determine the feasibility of producing and marketing lump charcoal from pinon pine. Analysis of this information and additional U. S. Forest Service reports, supplemented by direct contact market research, indicates that a market for lump charcoal exists. Briquet producers are unable to fill this need because of the nature of raw material feedstocks. The present lump charcoal market

(approximately 10,000 tons per year in California) is presently supplied from unreliable Mexican sources and the market can be penetrated to some extent. Calculations in this study are based on a 5,000 ton per year operation. The estimated facility, equipment, and operating capital required for a facility this size are presented in Table VI.

TABLE VI

CAPITAL REQUIREMENTS--5,000 - TON/YEAR
BULK CHARCOAL PRODUCTION FACILITY

	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Site Development and Facilities</u>		
Forest Camp - grading, sidings, sanitation, and utility systems	---	\$ 3,000
Plant Site - grading, sidings, fencing, blacktop, utility systems, and buildings	---	25,000
<u>Harvesting Equipment</u>		
Chain and Reciprocating Saws (16)	\$ 450	\$ 7,200
Circular Saws (3)	2,500	7,500
Belt Type Loaders (4)	2,500	10,000
Lift Loaders (2)	4,500	9,000
2½ Ton Dump Trucks (6)	7,000	42,000
¾ Ton Pick-Up Trucks (4)	3,000	12,000
Misc. Hand Tools	---	2,000
Air Compressor	800	800
Electric Generator	---	2,000
<u>Kilns (40)</u>	3,000	120,000
<u>Truck Scales</u>	---	8,000
Subtotal		\$248,500
Operating Capital		125,000
Total Capital Required		<u>\$373,500</u>

b. Sales and Costs--Table VII is a summary of a preliminary analysis to analyze estimated sales and costs for a 5,000-ton/year bulk lump charcoal operation.

TABLE VII

SALES AND COST ESTIMATES FOR A
5,000 - TON/YEAR
BULK LUMP CHARCOAL PRODUCTION FACILITY

	<u>Per Ton</u>
<u>Sales</u>	\$ 60.00
<u>Costs</u>	
Harvesting	43.20
Charcoaling	<u>27.44</u>
Subtotal	\$ 70.64
Administrative and Indirect Costs (12% sales)	<u>7.20</u>
Subtotal	\$ 77.84
Transportation to California	<u>15.00</u>
Total Delivered Cost in Bulk	\$ 92.84
<u>Summary</u>	
Gross Sales	\$ 60.00
Less Total Delivered Cost	<u>92.84</u>
Gross Loss	\$(32.84)

NOTE: The present low price of Mexican lump charcoal in the California market (\$60.00) and the relatively high cost of harvesting and charcoaling of the pinon pine (\$70.64) are substantiated by information compiled by EDA. The low market price must substantially improve and more efficient harvesting and charcoaling methods be employed before a profitable venture can be established.

5. CHARCOAL BRIQUET ANALYSIS

a. Market Research--Surveys made in Utah and Colorado indicated that estimates made by Utah State University researchers in 1965 were approximately correct. All sources indicated the market to be growing at a rate of approximately five percent per year. Based on the 1965 data and the five percent annual growth, the current charcoal briquet market in the five-state Intermountain Area is as shown in Table VIII.

TABLE VIII
FIVE-STATE CHARCOAL BRIQUET SALES
1965 AND 1968

	Sales (Tons)	
	<u>1965</u>	<u>1968</u>
Utah	2,000	2,310
Colorado	4,600	5,313
New Mexico	1,615	1,865
Arizona	3,560	4,112
Nevada	<u>900</u>	<u>1,040</u>
Total	12,675	14,640

The major part of the charcoal briquet supply is imported into the Intermountain Area from east of the Mississippi. The nearest supply comes from as far away as North Dakota. Figure 1 shows locations of the major U. S. charcoal briquet producers as of July 1, 1968.

A survey of the Salt Lake City area that included over 25 percent of the 1968 charcoal market showed distributor cost, retail cost, and consumer prices. Results of the survey indicate there are three basic types and price ranges for charcoal briquets and that materials used for making them vary from hardwood to waste products and lignite. Type I charcoal, made of the best grade hardwood, is manufactured by a firm that has an established reputation for superior quality. Type II charcoal is manufactured from hardwood but does not have the same reputation for high quality as Type I. Type III charcoal is manufactured from lignite.

Table IX shows examples of wholesale prices for each type of charcoal briquet.

TABLE IX

WHOLESALE PRICE OF CHARCOAL BRIQUETS IN
SALT LAKE CITY
1968

<u>Type Package</u>	<u>Price Per Ton</u>		
	<u>Type I</u>	<u>Type II</u>	<u>Type III</u>
Six 5-lb bags	\$130.00	\$120.60	\$ ---
One 10-lb bag	118.00	---	88.00
Five 10-lb bags	---	112.40	---
One 20-lb bag	114.00	102.20	84.00

Detailed information concerning the quantities, packaging and pricing of charcoal briquets in the Salt Lake City area is contained in Table X.

TABLE X

CHARCOAL BRIQUET SALES BY A
MAJOR SALT LAKE CITY DISTRIBUTOR
1968

	Total Sales			Price	
<u>Package</u>	<u>Units</u>	<u>Pounds</u>	<u>Distr Cost</u>	<u>Wholesale</u>	<u>Retail</u>
Type I					
Six 5-lb bags	2,164	64,920	\$1.95	\$2.10	\$0.49
One 10-lb bag	29,178	291,780	0.59	0.66	0.89
One 20-lb bag	10,116	202,320	1.14	1.23	1.59
Subtotal		559,020			
Type II					
Six 5-lb bags	682	20,460	1.81	1.92	0.43
Five 10-lb bags	5,132	256,600	2.81	2.95	0.79
One 20-lb bag	3,214	64,280	1.03	1.10	1.49
Subtotal		341,340			
Type III					
One 10-lb bag	31,421	314,210	0.44	0.46	0.69
One 20-lb bag	3,045	60,900	0.84	0.90	1.19
Subtotal		375,110			
Total		1,275,470	(638 Tons)		

Estimated facility, equipment, and operating capital required for a 5,000-ton/year charcoal briquet production facility is presented in Table XI. This is the minimum size operation that should be contemplated.

TABLE XI
CAPITAL REQUIREMENTS--5,000-TON/YEAR
CHARCOAL BRIQUET FACILITY

	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Site Development and Facilities</u>		
Forest Camp - grading, sidings, sanitation, and utility systems	---	\$ 3,000
Plant Site - grading, sidings, fencing, blacktop, utility systems, and buildings	---	61,000
<u>Harvesting Equipment</u>		
Chain and Reciprocating Saws (16)	\$ 450	\$ 7,200
Circular Saws (3)	2,500	7,500
Belt Type Loaders (4)	2,500	10,000
Lift Loaders (2)	4,500	9,000
2½ Ton Dump Trucks (6)	7,000	42,000
¾ Ton Pickup Trucks (4)	3,000	12,000
Misc. Hand Tools	---	2,000
Air Compressor	800	800
Electric Generator	---	2,000
<u>Kilns (40)</u>	3,000	120,000
<u>Briquet Plant</u>		
Briquetting Equipment	---	\$150,000
Accessory Equipment	---	25,000
<u>Truck Scales</u>		8,000
Subtotal		\$459,500
Operating Capital		160,000
Total Capital Required		<u>\$619,500</u>

b. Sales and Costs--Table XII is a summary of estimated sales and costs for a 5,000-ton/year charcoal briquet operation.

TABLE XII

SALES AND COST ESTIMATES FOR A
5,000 - TON/YEAR
CHARCOAL BRIQUET PRODUCTION FACILITY

	<u>Per Ton</u>
<u>Sales</u> (in 10-lb. bags)	\$112.40
<u>Costs</u>	
Harvesting	\$ 43.20
Charcoaling	27.44
Briquetting	25.00
Bagging	10.00
Subtotal	\$105.64
Administrative and Indirect Costs (15% sales)	16.86
Subtotal	\$122.50
Transportation (average - to Salt Lake and Denver)	\$ 6.00
Total Delivered Cost	\$128.50
<u>Summary</u>	
Gross Sales	\$112.40
Less Total Delivered Cost	128.50
Estimated Gross Loss	\$(16.10)

NOTE: It is evident that more efficient harvesting and charcoaling methods must be employed if such a venture is to be profitable.

6. QUALITY ANALYSIS OF PINON PINE CHARCOAL

One of the primary concerns relating to production of charcoal from the pinon pine reserves located on the Uintah and Ouray Indian Reservation has been the quality of the product. Keeter Charcoal Company of Branson, Missouri, recognizing the importance of this factor, offered to make an independent quality determination of ten cords of the pinon pine cordwood. This quantity was loaded into one of Keeter's Missouri-type kilns, charred and then made into briquets for final analysis. Keeter's findings are:

1. Charcoal yield from the ten measured cords of pinon pine was 610 lb/cord, requiring 3.3 cords to make one ton of charcoal.
2. Yield of Ozark hardwood is approximately double that of the pinon pine per measured cord of wood.
3. Harvesting costs/acre are such an indeterminate factor that payment of approximately \$10 per cord delivered into the kilns is recommended.
4. Pinon pine does make a desirable raw charcoal; however, the yield per measured cord very likely makes it prohibitive for charcoal.

Results of the laboratory analysis and observations by Keeter Charcoal Company are presented in Figures 2 and 3.

KEETER CHARCOAL COMPANY

BRANSON, MISSOURI

P. O. BOX 653

March 12, 1969

OFFICE:

EDison 4-2484

EDison 4-3921 (Manager's Res.)

PLANT:

EDison 4-5842

Mr. Galen D. Dawson
Thiokol Chemical Corporation
Economic Development Operations
3340 Airport Road
Ogden, Utah 84402

Dear Sir:

Enclosed please find a copy of the analysis which we had run on pinion pine charcoal briquets. Pinion pine does make a desirable raw charcoal, however, the yield per measured cord of wood would very likely make it prohibitive from use for charcoal.

The ten measured cords of pinion pine that we burned yielded 6,100 lbs. of raw charcoal, approximately 600 lb. per cord of wood. That yield would take 3 1/3rd cord of wood to make one ton of charcoal compared with 1.6 cord of Ozark hardwood per ton of raw charcoal. The pinion pine weighs only approximately 3,000 lbs. per cord, whereas, Ozark hardwood weighs approximately 5,130 lbs.

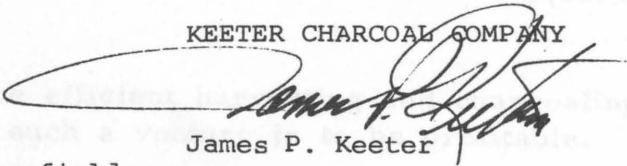
The cost per acre would vary so much in cords of wood that there would be no way of estimating the cost of harvesting per acre.

We pay \$10.00 per cord delivered into our kilns. We have never had any wood cut by the hour. Some inexperienced people have tried cutting wood by the hour, against our recommendations, but have never been successful at it. If they stayed in the cord wood business they ended up paying for it by the cord.

We are indeed sorry we have been so slow getting this information to you, however, we do not consider ourselves an authority on charcoal production from pinion pine since we have only been exposed to such a small amount. If we can be of any further help, please let us know.

Yours very truly

KEETER CHARCOAL COMPANY



James P. Keeter

JPK:Z

cc: Vernon C. Bottenfield

Figure 2

ANALYSIS OF
COAL
PETROLEUM PRODUCTS
WATER
FOOD PRODUCTS
INSECTICIDES
HERBICIDES
VETERINARY MEDICINES
CHEMICAL PRODUCTS

CERTIFICATE OF COAL ANALYSIS INDUSTRIAL TESTING LABORATORY

ANALYTICAL AND CONSULTING CHEMISTS

TELEPHONE VICTOR 2-7015
804 WOODSWETHER ROAD
KANSAS CITY, MISSOURI 64105

MEMBER:
AMERICAN SOCIETY FOR TESTING MATERIALS
AMERICAN CHEMICAL SOCIETY

DATE February 21, 1969 LABORATORY NUMBER 120-376

SAMPLE MARKED: Pinion Pine Charcoal Briquets

SUBMITTED BY: Keester Charcoal Company

Branson, Missouri

AS RECEIVED:		ANALYSIS	
MOISTURE	- - - - -	1.31	%
ASH	- - - - -	7.20	
VOLATILE MATTER	- - - - -	30.86	
FIXED CARBON	- - - - -	60.63	
SULFUR	- - - - -	0.22	
HEAT OF COMBUSTION	- - - - -	11,416	B.T.U. PER L.B.
DRY BASIS:			
ASH	- - - - -	7.30	%
VOLATILE MATTER	- - - - -	31.27	
FIXED CARBON	- - - - -	61.43	
SULFUR	- - - - -	0.22	
HEAT OF COMBUSTION	- - - - -	11,568	B.T.U. PER L.R.
FUSION POINT OF ASH	- - - - -		°F.
FREE-SWELLING INDEX	- - - - -		

RESPECTFULLY SUBMITTED
INDUSTRIAL TESTING LABORATORY

FORM 16

By *[Signature]*

Figure 3

7. PINON PINE FIREWOOD ANALYSIS

a. Market Research--Existing reports indicated a 1964 firewood market of 8,000 tons for the area comprised of Denver, Colorado; Albuquerque, New Mexico; Salt Lake City, Utah; Phoenix, Arizona; and Reno, Nevada.

Results of a preliminary survey by the Thiokol-BIA-Ute study team to verify the magnitude of the current Salt Lake City and Denver market areas indicated that they are larger than 1965 estimates, and are growing. Fireplaces are very popular in the region, and a high percentage of new homes have them. Pinon pine is by far the most popular firewood; so much so that most firewood dealers do not stock any other types of wood.

TABLE XIII

COMPARISON OF DENVER AND SALT LAKE FIREWOOD MARKETS

	Estimated Market (Tons)	
	1964	1968
Denver	2,000	4,450
Salt Lake City	1,800	2,520
Denver Area	---	(5,950)
Salt Lake City Area	---	(3,100)
Total (area)		9,050

With an effective marketing program, an efficient operation could penetrate this market 40 percent, or 3,600 tons.

Table XIV reflects the 1968 wholesale and retail prices of firewood in the Denver and Salt Lake City areas.

TABLE XIV
PRICES OF PINON FIREWOOD IN
DENVER AND SALT LAKE CITY
1968

Lot Size	Price (Per Ton)	
	Wholesale	Retail
<u>Salt Lake Area</u>		
500 lb.	---	\$40
1,000 lb	---	34
2,000 lb	\$ 20	32
<u>Denver Area</u>		
500 lb	---	52
1,000 lb	---	44
2,000 lb	24	42

Additional factors pertaining to these markets are:

1. Most firewood cutters and truckers operate only part time.
2. Sources of supply are undependable.
3. Early snows in the area make procurement of even a minimum supply difficult.
4. Many of the firewood dealers would be pleased to enter into firm contracts with a reliable supplier that can assure delivery.
5. Most pinon pine is transported more than 150 miles to market.

Estimated facility, equipment, and operating capital requirements for a 3,600-ton/year pinon pine firewood production facility are presented in Table XV

TABLE XV

CAPITAL REQUIREMENTS -- 3,600-TON/YEAR
PINON PINE FIREWOOD PRODUCTION FACILITY

	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Site Development and Facilities</u>		
Plant Site - grading, fencing, and storage shed	---	\$ 8,000
<u>Equipment</u>		
2½ Ton Trucks (4)	\$ 7,000	\$ 28,000
¾ Ton Pickup Truck	3,000	3,000
Belt Type Loaders (2)	2,500	5,000
Hydraulic Lift Loaders (2)	4,500	9,000
Self-Powered Circular Saw	2,500	2,500
Splitters (2)	2,500	5,000
Chain Saws (8)	450	3,600
Miscellaneous Hand Tools	---	1,000
Air Compressor	550	550
Electric Generator	1,000	1,000
Subtotal		\$ 66,650
Operating Capital		<u>39,000</u>
Total Capital Required		\$105,650

b. Sales, Costs, and Profits--Table XVI is a summary of anticipated sales, costs, and profits for a 3,600 ton yearly pinon pine firewood operation. A cost of approximately \$13.09 per ton (cord equals 2,000 pounds dry) is estimated to cut, trim, buck and transport the dry pinon to the wood lot. Sales and administration expenses are estimated at 12 percent of sales. Costs include allowance for repair, maintenance and depreciation of equipment. Cost of loading and transporting the wood to market is estimated at \$4 per ton to Salt Lake City (150 miles) and \$7 per ton to Denver (350 miles).

TABLE XVI

SALES, COSTS, AND PROFITS OF A 3,600-TON/YEAR
PINON PINE FIREWOOD PRODUCTION OPERATION

	<u>Sales (Tons)</u>	<u>Wholesale Price</u>	<u>Total Sales</u>
<u>Sales</u>			
Salt Lake City Area	1,200	\$20	\$24,000
Denver Area	2,400	24	57,600
Sales	3,600		\$81,600
<u>Costs</u>			
Harvesting (at \$13.09 per ton)			\$47,124
Administrative and Indirect Costs (12% sales)			9,792
Subtotal			\$56,916
Transportation (average \$6 per ton)			21,600
Total Delivered Cost			\$78,516
<u>Profit</u>			
Estimated Gross Sales			\$81,600
Less Total Delivered Cost			78,516
Gross Profit			\$ 3,084

CONCLUSIONS AND RECOMMENDATIONS

Conclusions presented here are based on the preceding information accumulated and analyzed during this economic development study of potential enterprises for the Ute Indian Tribe on the Uintah and Ouray Reservation.

Recommendations indicate the need for further cooperative efforts on the part of the Ute Indian Tribe, the Bureau of Indian Affairs, and interested industrial firms in planned economic development leading to sound tribal investments in profit-making enterprises that will provide jobs for presently underemployed tribal members.

A. CONCLUSIONS

Specific conclusions are based on the findings of the study team during this economic development effort.

1. World, national, and local chemical fertilizer markets presently are depressed since production over-capacity has led to large inventories, price discounting, and competitive marketing practices. Farmers in the Intermountain Area have not used urea fertilizers in the quantities they use other fertilizers. Urea as animal feed, greater than as fertilizer, is projected to increase continually. The projected 1972 61,000-ton-per-year urea rate of consumption in the Intermountain Area is not sufficient to justify a 200-ton-per-day (66,000-ton-per-year) plant since established producers still will maintain a share of the market.
2. Lump charcoal produced from pinon pine can be marketed on the West Coast at a rate of 5,000 tons per year. The price of the charcoal must meet the Mexican lump charcoal price if it is to gain acceptance and the source must be dependable. Efficient harvesting and charcoaling methods will be necessary to realize a satisfactory profit. Cost analysis indicated net losses would be incurred under present conditions.

3. Charcoal briquets produced from pinon pine and juniper can be marketed in such Intermountain Area markets as Salt Lake City and Denver at a volume of 3,500 tons per year, which is approximately 50 percent of the total 7,000 ton per year market. A 5,000 ton per year production rate is necessary, however, to maintain efficient briquetting processes. Competition from firms utilizing low cost wood waste and lignite feed stocks in processes utilizing the highly automated carbonizing retort furnace places harvested charcoal briquet operations at a possible economic disadvantage. Cost analysis indicated net losses would be incurred under present conditions.

4. Quality analysis of lump charcoal and charcoal briquets produced from pinon pine were conducted under production conditions by a top producer-marketer of charcoal briquets in an effort to compare the quality of pinon pine charcoal briquets with that of Ozark hardwood charcoal briquets. The pinon pine product proved to be inferior to the hardwood product in briquet form; however, the pinon pine lump charcoal obtained was of good quality with only one possible objectionable characteristic--the charcoal retains its pine resin odor and must be tested for consumer acceptance.

5. Pinon pine firewood can be marketed in Intermountain Area markets at a rate of 3,600 tons per year, which is approximately 40 percent of the total 9,000 ton per year market. Pinon pine is the most popular firewood and dealers are seeking dependable supply sources that will ensure delivery. A reliable plan for marketing Ute firewood would gain an even greater share of the market. Other forms of wood products such as cedar posts and particle board made from chips possibly could be processed following initial entry into the markets. Cost analysis indicated a marginal return under present conditions.

The following factors (locale, working conditions, culture) will have a direct influence on the economic development of the Uintah and Ouray Reservation.

1. Ute Indians love their land, their families, and their customs. The majority of them do not want economic development that will draw them away from their way of life and enjoyment of their privileges on the Reservation. The individual Indians who become more acculturated (approximately 400 of the 1,650 population) have an

established program to enable them to relocate with training and job opportunities.

2. Ute Tribal leaders, supported by BIA personnel, have a two-fold interest in economic development of the Reservation. First, they desire job-producing industries utilizing efficient, automated labor-saving equipment to correct the high, 60 percent rate of unemployment. Second, they are willing to invest tribal funds in a good industry to gain a suitable return on their investment. Initially, they would prefer to hold a minority interest in such an enterprise, with management and control by a private company.
3. Value of assets remaining to the Ute Indian Tribe at this time are substantial--1.1 million acres of surface area, mineral rights to 3/4 of the subsurface area of 1.25 million acres, over \$8 million security invested, and unadjudicated claims against the U. S. Government. On this basis, the net worth of each accredited Ute Tribal member is considerable.
4. The issue of "termination" is foremost in the minds of the Indian leaders. They question whether future progress will mean withdrawal of help that has made them more capable under BIA programs. This feeling is accentuated by the positive cooperative attitude exhibited by the present BIA Reservation superintendent and his staff in working with the Ute Tribe. In the mid-1950's and early 1960's, Public Law 671 resulted in termination of 490 mixed-blood members of the Ute Tribe under the theory that they have attained a level of education and sophistication equal to their non-Indian neighbors. In the termination process, a large percentage of the financial proceeds to the mixed-blood members were lost, and Tribal members feel that, under "termination," they again would lose such proceeds.
5. With the exception of farming, no individual Ute Indians operate their own businesses, and very few operate their own farms. More than 40,000 acres of irrigated Reservation farmland is not being cultivated. The short agricultural growing season is a problem; however, good cattle feed crops such as milo are in demand and could be raised on this land. The dairy business is highly successful in the Uintah Basin and is one in which individual Indian families could, with proper training and guidance, operate successfully.

B. RECOMMENDATIONS

The following specific recommendations are made after analysis of preceding conclusions.

1. The Ute Tribe should employ a full-time economic development professional to work with tribal and BIA Economic Development Reservation action groups. Experienced consultants should be employed, for periodic assignments, to perform certain technical evaluations. Federal aid should be sought for the accomplishment of programs that benefit both the Ute Indian Tribe and the United States Government.
2. Due to the presently depressed world, national, and Intermountain Area fertilizer markets, the Ute Tribe should not enter into a urea fertilizer enterprise under existing conditions. A continuing surveillance of these markets should be maintained, however, to assure awareness of any significant changes in Intermountain Area farming and livestock feeding techniques.
3. Due to the competitive disadvantages facing the Ute Tribe in both the lump charcoal and charcoal briquet markets, it should not enter into a pinon pine charcoal enterprise under existing conditions. A continuing surveillance of these markets should be maintained, however, to assure awareness of higher market prices and the possibility of utilizing more efficient timber harvesting and charcoaling methods.
4. Support of local, county, and state officials should be continued in efforts to develop better transportation systems for the Uintah Basin, and to examine all possibilities for bringing a railroad spur into the area. "Piggy-back" and containerized shipping techniques should be investigated to determine means of removing some of the present disadvantages of remote transportation.
5. Present planning efforts being conducted in cooperation with the BIA should be intensified to prepare for greater utilization of the natural resources available on the Reservation. A comprehensive economic mineral and natural resource survey is recommended to determine the extent of hydrocarbon and other mineral deposits there. A plan should be developed for a period of five years projected into the 1980's.

KEY PERSONNEL

The team that conducted this study was composed of the following representatives of Thiokol Chemical Corporation, the Bureau of Indian Affairs, and the Ute Indian Tribe.

Galen D. Dawson
Study Director
Thiokol Chemical Corporation

Vernon C. Bottenfield
Bureau of Indian Affairs

Clifford Duncan
Ute Indian Tribe

Henry A. Reinert
Thiokol Chemical Corporation

Lawrence C. Taylor
Market Research
Thiokol Chemical Corporation -
Utah State University

Vitae of these team members are presented on the following pages.

GALEN D. DAWSON
Study Director
Thiokol Chemical Corporation

As director, Mr. Dawson has been responsible, through Robert L. Marquardt, Thiokol Vice President, to the Bureau of Indian Affairs and the Ute Tribal Council for the successful direction and coordination of this Uintah and Ouray Reservation industrial development study.

As development engineer with Thiokol's Economic Development Operations since 1966 he has been responsible for the design, construction, and equipage of the company's operating divisions at Clearfield, Utah, Roswell, New Mexico, and San Antonio, Texas. For seven years prior to that he assisted in designing, building, and equipping Thiokol's major solid propellant rocket R & D and production facility near Brigham City, Utah.

Mr. Dawson worked for Phillips Petroleum Company for 11 years previously as a refinery and facilities engineer. He served in the U. S. Army during World War II and the Korean conflict.

Mr. Dawson received a B.S. degree in civil engineering from Kansas State College (1948) and a B.B.S. degree in business administration from Baylor University (1957).

VERNON C. BOTTENFIELD
Market Research Specialist

Mr. Bottenfield was assigned membership on the study team by the Uintah and Ouray Reservation Programs Office in Fort Duchesne, Utah. As BIA Reservation Programs Officer, he is responsible for most phases of economic and social development of the Reservation and its inhabitants. As one of two staff members he advises the Reservation Superintendent on these matters.

Mr. Bottenfield also has served as BIA resources development officer in Montana and Alaska from 1962 to 1967. He was a geographic intelligence researcher for a year with the federal Area Analysis Intelligence Agency in Washington, D. C. There he researched physical geography of Central Africa, and social and physical geography of parts of the Far East. He also briefed and debriefed U. S. Army personnel and attaches during this period.

In addition, Mr. Bottenfield has had extensive experience as a cartographer with federal government agencies and as a geography instructor at the University of Utah. He also has experience as an oceanographic aide and soils engineer in government and industry, and a biographical aide in forestry. He served in the U. S. Army during the Korean conflict.

Mr. Bottenfield has a B.S. degree in general science from Colorado State University. He also did undergraduate studies at Northwestern University. He has an M.A. degree in geography from the University of Hawaii, and has done predoctoral work in geography at the Universities of Kansas and Illinois.

CLIFFORD DUNCAN

Researcher Specialist and Tribal Member

Mr. Duncan, a Ute Indian and member of the Ute Tribal organization, very successfully researched Reservation resources and economic factors while acting as intermediary with the Ute Tribal Council during the program.

As a long time worker for the Ute Tribe and the Bureau of Indian Affairs, Mr. Duncan has served as an assistant engineer, a surveyor aide, and a custodial supervisor. He also has been an assistant nurse at the Veterans Administration Hospital in Salt Lake City.

Mr. Duncan is a graduate of Union High School in Roosevelt, Utah. In 1965, he received extensive Office of Economic Opportunity sponsored youth camp and small business management training in New York and Arizona.

HENRY A. REINERTH
Finance and Administration

Mr. Reinerth directed financial and administrative efforts in this development study. He was responsible directly to the Study Director.

Mr. Reinerth was temporarily on loan from Thiokol's Clearfield Division where he was Associate Director of Administration, responsible for contract administration and negotiation, purchasing, material control, cost analysis, financial controls, and budgets.

Before joining Thiokol, Mr. Reinerth was employed by the U. S. Air Force where he directed procurement, negotiation, and administration of major defense hardware contracts involving hundreds of millions of dollars. He also worked in the sales organizations of several major concerns, including American Airlines and Armour Company. He is a veteran of Navy service.

Mr. Reinerth received his college training at Ohio State University.

Extensive experience in his many business and academic pursuits in the Intermountain Area made Mr. Taylor well qualified to advise the study on the many aspects of this study. Thus, the team had access to great quantities of little known available information about the Uintah and Ouray Reservation, and about previous studies made there.

BIBLIOGRAPHY

Many sources of information were researched by the Thiokol-BIA-Ute study team during this investigation. The sources included research of existing literature, coordination with representatives of companies having experience in the area of interest, and consultation with persons having direct knowledge of the Reservation and the products evaluated. The most prominent of these sources include:

1. EXISTING LITERATURE

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H. K. Ferguson Company, Inc.

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M. W. Kellogg Company

Division of Pullman Incorporated

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New York, New York 10017

Chemico

Chemical Construction Corporation

320 Park Avenue

New York City, New York 10022

C & I Girdler, Inc.

256 McCullough Street

Cincinnati, Ohio 45226

Foster Wheeler Corporation

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Wasatch Chemical Company

2225 South 5th East

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Pax Company (Utah Farmers Coop)

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Pillsbury Feed Plant

2805 Glove Mills Avenue

Ogden, Utah

R. J. Wight Feed Company

860 West 24th Street

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F. P. Nielson Feed Company
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Tremonton, Utah

Intermountain Farmers
1800 South West Temple
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Western Nitrogen Company, Inc.
212 Felt Building
Salt Lake City, Utah 84101

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Keeter Charcoal Company
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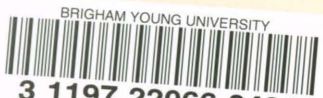
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